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THE SURGICAL TREATMENT OF CONSTIPATION.

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IN the year 1924 Royle[1] drew attention to the fact that section of certain fibres in the lumbar outflow to the involuntary nervous system was sometimes followed by disappearance of constipation. Wade[2] resorted to a similar procedure in the treatment of obstinate constipation of the Hirschsprung type, with satisfactory results. The work has been followed up by other surgeons. Judd and Adson[3] have published a paper dealing with the subject.

The author has conducted a series of experiments on animals during recent years and has made certain observations in the course of operations upon human beings. The work is still in progress and this paper is in the nature of a preliminary report only. The experimental work has been carried out at the Baker Medical Research Institute, Melbourne.

In order that the subject may be approached rationally, it is necessary to have a sound appreciation of the anatomy of the involuntary nervous system, of the physiology of the neuro-muscular mechanism of the lower gut, and of the effects of disease upon this mechanism.

Anatomy.

It is unnecessary to reproduce again the famous diagrams of Gaskell which depict the nature of reflex arcs, contrasting those of the involuntary with those of the voluntary nervous system and showing the situations of the various cell stations. On the other hand, the descriptions of the abdominal and pelvic portions of the involuntary nervous system which appear in standard text books of anatomy are very confusing and indeed inaccurate. A mass of names serves to obscure completely the

simple plan of the system which was so well known to physiological workers at the end of the nineteenth century (Langley, Gaskell, Bayliss, Starling, Elliott and others).

In animals the general plan was found to be as follows (Figure I). From cells in the lumbar segments of the spinal cord fibres passed out by way of the white rami from the upper lumbar nerves to the lateral sympathetic chain on each side and shortly after left again to pass ventrally and caudally to the inferior mesenteric ganglion or ganglia situated in the mesentery of the colon near the origin of the inferior mesenteric artery from the aorta. Here most of the fibres arborized about ganglion cells, although many passed through the ganglion to make connexion with cells placed further afield. From the ganglion or ganglia nerves passed to the colon in company with branches of the inferior mesenteric artery. A nerve passed upwards in front of the aorta to the region of the cœliac plexus with which is established communication, and two large bundles passed downwards in front of the aorta to the pelvis, where they joined up with branches issuing from the sacral nerves, usually the second and third, to form networks or plexuses lying on either side of the pelvic viscera. From these plexuses branches passed to the colon, bladder, uterus, prostate, vesicles and so on. The sacral visceral nerves just mentioned originated in cells in the sacral cord and had their cell stations in the walls of the viscera to which they passed. The various nerves were named as shown in Figure I. The inferior or lumbar splanchnics pass from the lumbar chain to the inferior mesenteric ganglion. The ganglion gives off colonic branches and the two hypogastric nerves, which pass downwards, one on either side of the rectum, to unite with the corresponding pelvic nerve to form the pelvic plexus. From this vesical, colonic and other branches pass to the various pelvic viscera. Figure II shows the arrangement in the dog.

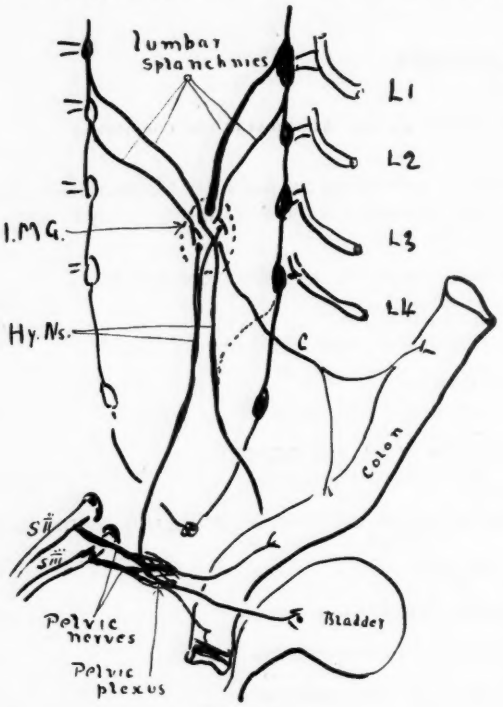

FIGURE I.

Scheme of involuntary nerves to the distal colon and bladder in animals. Fibres which have arisen in the cells of the lumbar segments of the spinal cord pass by way of the white rami from the upper lumbar nerves to the abdominal lateral chain and then by way of the lumbar splanchnic nerves to the inferior mesenteric ganglion, I.M.G. From this ganglion branches (C) pass to the colon and the hypogastric nerves (Hy. Ns.) descend to the pelvis to take part in the formation of the pelvic plexus. From certain sacral nerves (SII, SIII) bundles pass to the pelvic plexus and are known as the pelvic nerve. From the pelvic plexus are derived mixed visceral branches to the colon, rectum, bladder *et cetera*. L1, L2 *et cetera* = lumbar nerves.

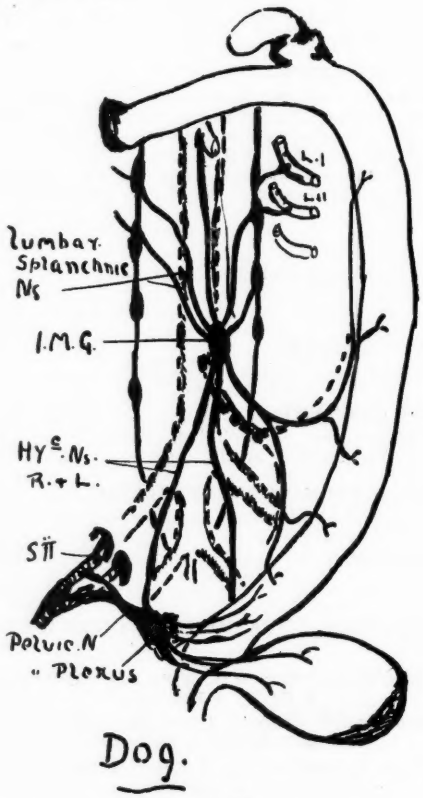

FIGURE II.

The arrangement of visceral nerves in the dog. The lumbar splanchnic nerves pass from the lumbar chains to the inferior mesenteric ganglion (I.M.G.), situated in the mesentery of the colon near the point of origin of the inferior mesenteric artery. From the ganglion a communication passes upwards to the cœliac area, colonic branches pass to the colon and the hypogastric nerves (Hyc. Ns.) pass to the pelvis to unite with the pelvic nerve to form the pelvic plexus from which mixed visceral fibres arise. SII = second sacral nerve.

For the purpose of this paper it is unnecessary to deal with visceral nerves of thoracic origin or non-visceral involuntary nerves.

Turning now to consider the arrangement in human beings, it is at once apparent that there is a

close agreement with that in animals as above outlined, and it would be strange if this were otherwise. Fibres pass from the lumbar chains to the region of the root of the inferior mesenteric artery where they form a tough meshwork containing numerous ganglion cells. This is undoubtedly the inferior mesenteric ganglion. From here branches pass to the colon along with branches of the inferior mesenteric artery. Usually a stout nerve bundle may be demonstrated passing upwards in front of the aorta to the cœliac area. A thick, strong branch passes downwards in front of the aorta to the pelvis. This branch may be represented by two nerve bundles, between which are many connexions, and in any case it always divides into two nerves, which pass one on either side of the rectum to join up with short branches from the third and fourth sacral nerves to form massive fan-shaped plexuses at the sides of the rectum and prostate, from which branches pass to the rectum, bladder and so on (Figure III).

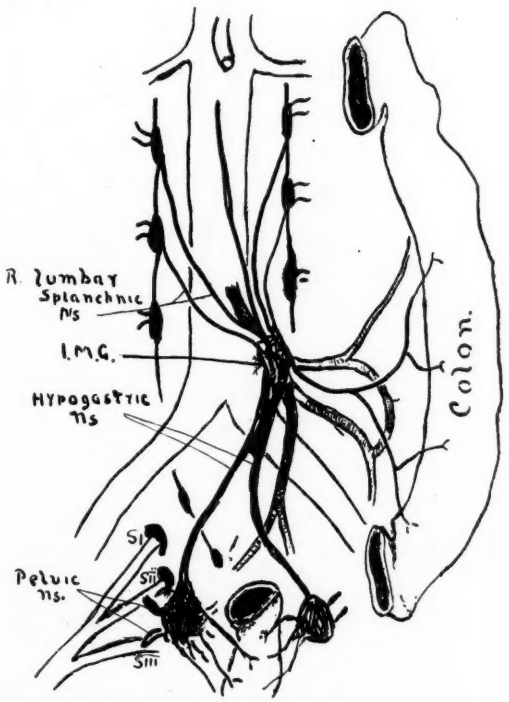

FIGURE III.

The arrangement of visceral nerves in man. This is very similar to that in the dog, except that the inferior mesenteric ganglion (I.M.G.) is represented by a stout network and the hypogastric nerves form in their upper parts a network or plexus usually described as the superior hypogastric plexus. The pelvic nerves are very short. Si, ii, iii = sacral nerves.

Thus the plan on which the nerves are laid down is similar to that found in animals, and it would be well if similar names were adopted. Instead one finds in the anatomical text books that the aortic plexus (which, be it noted, has its origin in the cœliac plexus) gives origin to the inferior mesenteric plexus from which numerous branches pass to the colon and rectum. The aortic plexus then passes into the hypogastric "plexus," which is further often divided into superior and inferior parts.

The reader must assume from the description that the aortic plexus, which has its origin from the thoracic or superior splanchnic nerves, is the main source of the nerve bundles which pass from the region of the root of the inferior mesenteric artery to the colon and also of the important hypogastric "plexus" passing to the pelvis. Spalteholz[4] does not mention the lumbar splanchnic nerves, and Cunningham[5] alludes to them briefly in passing as reinforcing the aortic plexus. There is no mention at all of the inferior mesenteric ganglion.

It would seem to be eminently desirable that someone with authority in the realms of anatomy should undertake a review of the nomenclature, and he could scarcely do better than to adopt that used by those very devoted and painstaking physiological workers, Langley and Gaskell. The aortic plexus would then sink into a position of relative insignificance. The lumbar splanchnics would appear as the main source of supply for the inferior mesenteric ganglion, from which would pass colonic nerves and the important hypogastric nerve or nerves. The latter, joining up with the pelvic visceral nerves (not *nervi erigentes*), would form the pelvic plexuses, from which would pass rectal, vesical, prostatic branches and so on. To quote Langley and Anderson:[6]

> The plexus to which branches of the hypogastric nerve run is commonly named the hypogastric plexus, but in fact by far the greater part of it consists of fibres from the pelvic nerve; on this account and because there is a certain absurdity in applying the term hypogastric to a plexus in the pelvic basin, we shall call it the pelvic plexus.

They were, of course, writing of animals.

Physiology.

From this point on the author proposes to use the nomenclature of Langley and Gaskell. From the point of view of the subject of dilated colon it is necessary to deal mainly with the extrinsic nerves. The muscle is apparently quite capable of contraction and peristalsis, and is indeed usually hypertrophied. The pelvic visceral nerves in all animals and almost certainly in man control mass evacuation. Stimulation under certain conditions evokes powerful contractions of the bladder and distal part of the colon with consequent expulsion of urine and fæces. Both circular and longitudinal muscle coats contract. The retaining sphincters are actively inhibited or relaxed. In animals, after section of the pelvic nerves the bowel is still able to expel fæces, but in a manner differing from the normal. Whereas in the intact animal the distal colon is emptied at infrequent intervals and a large stool is passed, in the animal after section of the pelvic nerves small amounts are passed frequently throughout the day. It is as though the mechanism of mass evacuation has been destroyed and its place taken by a series of ordinary peristaltic waves which are, as is well known, quite capable of moving on the contents of the gut in the absence of extrinsic

nerves. There is usually some dilatation of the distal part of the colon, but the picture scarcely resembles that of Hirschsprung's disease. Further observations on the effect of stimulation and degenerative section of the pelvic nerves will be published at a later date.

Turning now to a consideration of the influence of the lumbar splanchnic nerves, it may be stated as an accepted fact that stimulation of these or of the branches of the inferior mesenteric ganglion causes in the main inhibition of both circular and longitudinal coats of the colonic musculature and contraction of the internal anal sphincter. Possibly it also causes the pelvi-rectal sphincter to contract. When the belly of an animal is opened there is usually no movement of the colon to be observed, and even stimulation of the pelvic nerves may fail to evoke a response until after the inferior splanchnic nerves have been divided. It is also extremely uncommon to observe any movement of the colon in man when the abdomen has been opened. If now in animals the lumbar splanchnics be divided, or the branches of the inferior mesenteric ganglion cut, and precautions are taken to keep the colon warm and moist, there is no difficulty in obtaining active peristaltic movements either spontaneously or as a result of various forms of stimulation. It would appear that with the splanchnic nerves intact there is active reflex inhibition of colonic musculature and that section of the nerves destroys the arcs upon which the reflex depends. The stimulus which activates the inhibitory reflex may act locally on the gut (for example, cold air or drying) or on the wound surfaces. It is, however, important to note that stimulation of any sensory nerve leads to inhibition of the gut movement (Bayliss and Starling[7]). In human beings spinal anæsthesia seems to abolish the reflex temporarily, though, of course, it also paralyses the pelvic nerve reflex. It is not uncommon for a patient so anæsthetized to pass fæces involuntarily, and indeed spinal anæsthesia has been advocated in the treatment of paralytic ileus on the assumption that this may be due to reflex inhibition of the gut. The gut muscle is "released" just as it is in animals on section of the lumbar splanchnics. An example of this "release" as observed in a woman with megalocolon after section of the lumbar splanchnic nerves is recorded in Case III.

As regards the actual course of nerve fibres from the spinal cord to the colon, there are two points of interest which have not been mentioned. From their origin in the cord fibres pass, as has been described, to the inferior mesenteric ganglion. Here many have their cell stations, but some lie further afield. It is of importance to note that fibres from each side decussate freely, so that both hypogastric nerves contain fibres from both left and right lumbar splanchnic nerves, which fibres may or may not have "relayed" in the inferior mesenteric ganglion. The other point of importance is this. The lumbar sympathetic trunk below the point of outflow of the lumbar splanchnics contains no fibres or only very few destined to supply any of the pelvic or abdominal viscera (Langley and Anderson[6] [8] [9]). Figure IV shows diagrammatically the course of fibres entering into the formation of arcs of the lumbar outflow of the involuntary nervous system.

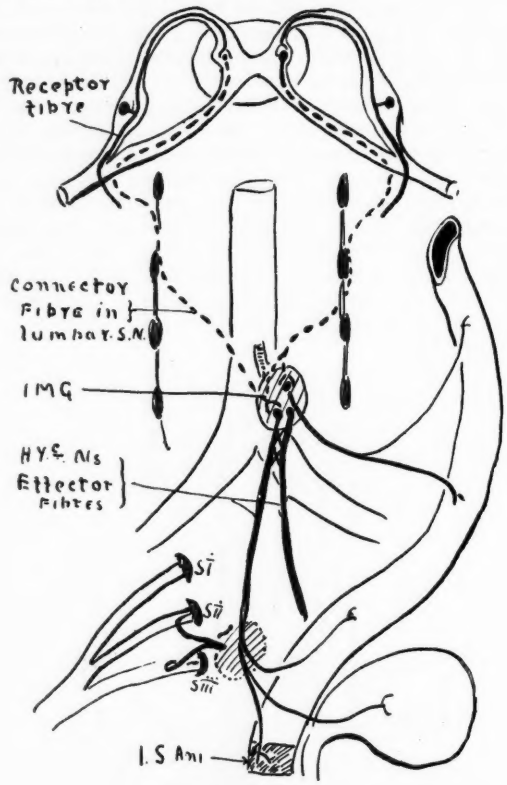

FIGURE IV.

Diagrammatic representation of fibres entering into the formation of involuntary splanchnic arcs in the lumbar outflow. Receptor fibres with cell stations in the posterior root ganglia arborize about cells of the lateral horn of the spinal grey matter; from these cells connector fibres pass out in the ventral roots *viâ* the white rami and lumbar splanchnic nerves to the inferior mesenteric ganglion (IMG) or at times to ganglia situated further afield. In the inferior mesenteric ganglion fibres decussate freely. Effector fibres arise in the ganglion and pass to the colon direct or by way of the hypogastric nerves (Hyc. Ns.) through the pelvic plexus to the rectum, bladder *et cetera*. The internal *sphincter ani* (I. S. ani) receives fibres by this route.

Enough has now been told of the anatomy and physiology of the region under review to enable the reader to appreciate the following argument.

It is possible to explain theoretically the condition known as Hirschsprung's disease and other conditions characterized by obstinate constipation and inert colonic musculature by assuming that there is at work an active reflex which effects inhibition of the musculature of the colonic wall, together with increased tone or spasm or deficient relaxation of the pelvi-rectal or internal anal sphincters. The reflex may be activated by some pathological process in the gut or elsewhere in the body which irritates or stimulates sensory nerve endings. More probably

no such abnormal factor is responsible, but the arcs are hypersensitive and react to stimuli which would not normally evoke a response. This lowering of the threshold may be but one manifestation of a widespread disorder of the nervous system akin to neurasthenia, or possibly it may be due to some diminution of control or inhibition normally exerted by the "head ganglion" of the sympathetic nervous system situated in the hypothalamus. In any case destruction of the arcs concerned will prevent active interference with the working of the musculature of the gut and leave the local neuro-muscular mechanism to its own devices. Beneficial effects following on this procedure are to be ascribed rather to the prevention of active inhibition of the gut wall and active excitation of the sphincters than to the unopposed action of the pelvic nerve.

Consideration of other abnormal states apparently due to faulty working of sympathetic reflex arcs makes it appear that this is not a fantastic assumption. Normally, when a limb is exposed to cold air, there is a reflex contraction of the muscle coats of arterioles which leads to blanching of the skin with consequent fall in temperature. The mechanism serves to prevent excessive loss of heat. Sometimes, as in Raynaud's disease, there is a grossly excessive reaction which may persist and lead to gangrene. Now it has been noted that section of the grey rami which transmit sympathetic fibres passing to a limb, results apparently in the abolition of this protective reflex, so that it remains much warmer than its fellow when both are exposed. Similarly, the abnormally excessive reaction seen in Raynaud's disease may be abolished and a permanently "warm" limb remains. Again, it has been observed that neurasthenic individuals frequently suffer from constipation and visceroptosis. They often give evidence of instability of action of the involuntary nervous system, such as flushing of the skin alternating with pallor. It is quite possible that "visceroptosis" and constipation are merely manifestations of the same abnormal nervous state.

Royle's observations encouraged him and Wade to design and put into practice an operation for the relief of patients with Hirschsprung's disease.[2] [10] In their operation the left side is approached and the white ramus from the first lumbar nerve is divided, together with that from the second, if present. Further, all medially going branches of the lumbar chain are sectioned, and, lastly, the trunk itself is divided below the fourth ganglion. This operation is open to objection on several counts. The colon is developed as a mid-line organ and receives nerves from both sides, the fibres of which decussate freely, as has been described. Possibly cure would have been more complete in cases reported had a more radical procedure been adopted. Bayliss and Starling[7] have shown that in animals reflex inhibition may still occur if only one splanchnic nerve be left intact. In Case IX (Wade) unilateral operation was ineffective. A similar operation performed on the other side led to satisfactory results. Section of the white rami probably results in division of many fibres not destined to reach the colon at all, and in any case those which would do so will certainly be divided either in the medially going branches (lumbar splanchnics) or possibly in the trunk below the fourth ganglion. Lastly, the trunk at the point selected for section contains practically no visceral fibres.

Judd and Adson,[3] following up the work of Wade and Royle, designed and practised a somewhat different operation. Briefly, the sympathetic trunk, including ganglia from just above the second to just below the fourth lumbar ganglia, was excised, either on the left or on both sides of the body. The left-sided operation leaves the right lumbar splanchnic nerves intact and thus may fail to "release" the gut, although, as the satisfactory results of Wade and Judd and Adson show, this is not always the case. Excision of the trunk and ganglia destroys practically the whole of the sympathetic outflow to the lower limb and other parts on the corresponding side of the body. The operation of Wade and Royle leaves part of the limb supply intact. Judd and Adson assume that the lumbosacral trunk carries important, if not the most important, rectal sympathetic supply. This is in direct conflict with the work of Langley and Anderson in animals and the observations of the author. Further, they accept the view quoted in their paper from Cunningham, that the longitudinal muscle of the rectum contracts in response to stimulation arriving by way of the pelvic nerve, whilst circular coat is activated by the lumbar sympathetic nerves. To quote from their paper: "The division of the lumbar sympathetic chain diminishes the sympathetic stimuli to the circular muscles of the rectum." This view of the motor innervation of the rectum was championed nearly fifty years ago by Fellner,[11] [12] but the work of Bayliss, Starling,[13] Langley and Anderson,[6] Elliott and Barclay-Smith,[14] and others would seem to have given it the death blow, and the author has no hesitation in stating that in dogs both coats contract on stimulation of the pelvic nerve and both are inhibited by stimulation of the lumbar splanchnic nerves. Elliott showed that the same plan held in many animals and there seems to be no good reason to suspect that man has been designed differently.

In order to insure that all inhibitory stimuli passing by way of the lumbar splanchnic outflow to the colon may be abolished, it is necessary to divide the inferior splanchnic nerves on both sides, proximal to the region of the inferior mesenteric ganglion, or to divide the colonic and ascending branches from this area together with the hypogastric nerve or nerves. In the first procedure (neglecting afferent or sensory fibres) only preganglionic (Langley) or connector (Gaskell) fibres would be divided; in the second mainly postganglionic (Langley) or excitor (Gaskell) fibres. At present not sufficient is known of the subject to permit of dogmatism in respect of the advantages

and disadvantages of dividing pre-ganglionic and post-ganglionic fibres respectively. Probably it would be better to leave the post-ganglionic fibres intact. It is to be remembered that sympathetic nerve fibres for the supply of the bladder, prostate *et cetera* pass by way of the splanchnic and hypogastric nerves, so that they will be destroyed in either case. This has apparently no very ill effects either in animals or in man (see case notes). Incontinence of urine does not follow, nor is bladder or rectal sensation abolished. The innervation of the voluntary sphincters of the anus and urethra is not disturbed, so that these may possibly take on added duties.

It is possible that section of the hypogastric nerve alone would be sufficient to permit of relaxation of the sphincters and to cure some cases of Hirschsprung's disease, but until more is known about the subject it would probably be wise to adopt a more radical procedure. The simplest way to do this is to divide the lumbar splanchnic nerves just proximal to the inferior mesenteric ganglion. Reports of three cases in which this has been done are appended.

The Operation.

The operation is performed as follows.

Open the abdomen through a left paramedian incision of generous length with its centre just above the umbilicus. Introduce retractors. Pull the small gut up and to the right and pack it out of the way. Locate the origin of the inferior mesenteric artery from the aorta. Incise the posterior peritoneum in this area. Bluntly dissect free and divide all nerves passing from the meshwork around the artery upwards and backwards on either side of the aorta. When this has been done the proximal 2·5 centimetres (one inch) of the inferior mesenteric artery look very thin and lonely (the inferior mesenteric vein is some distance away). Close the wound in the posterior peritoneum. Close the wound in the belly wall.

Case Histories.

Case I: A spinster, aged thirty-five years, first came under the notice of the author in the year 1925. The physician in whose charge she was at that time (Dr. J. F. Chambers) regarded her as an extremely neurasthenic individual, but requested that a thorough examination of the urinary tract should be undertaken. Previously she had suffered from numerous ailments, including enteric fever, diphtheria, rheumatic fever, measles and middle ear disease complicated by labyrinthitis, for which she had undergone operative treatment. The present complaint was of pain in attacks resembling right renal colic. Examination failed to reveal any abnormality except that the right kidney was easily felt, and a pyelogram disclosed a sharp Z-shaped bend in the ureter just below the renal pelvis. Exploration was undertaken on May 26, 1925, and very little abnormality was found. An attempt was made to fix the kidney. No relief followed and a second pyelogram showed that the kinking previously present had disappeared, but that there was now some dilatation of the renal pelvis. Eventually, on November 18, 1925, the kidney was removed. Relief of pain followed immediately. During the course of the next year the patient frequently complained that she had difficulty in voiding urine. No cause could be found for this; her statements were treated with but little consideration. Then the patient complained that her bowels were becoming very difficult to manage, although previously she had had no trouble. Examination showed that the abdomen was very distended, although she was very thin. This distension had definitely not been present in the year 1925. An opaque enema disclosed enormous dilatation of the colon right down to the anus. Observation in hospital confirmed her statement that the bowels opened only at intervals of a week or more. Enemata were only occasionally successful.

On April 30, 1928, operation was undertaken, as described earlier in this paper, except that in addition to dividing the lumbar splanchnics the left lumbar chain was divided below the fourth lumbar ganglion. Convalescence was uneventful. An enema was given a few days after operation and from then on until the present there has been no retention of fæces, defæcation occurring once or twice daily without medicinal aid. Micturition has been normal for the most part, but soon after operation there was some loss of control at night and again later during occasional attacks of diarrhœa. The patient states that now when she has a desire to micturate she must do so within five or ten minutes. Abdominal distension has largely disappeared and the calibre of the colon, as shown by an opaque enema, is much less than formerly.

It is tempting to assume that the renal colic, retention of urine and retention of fæces with megalocolon were all part and parcel of the state of "neurasthenia," affecting in this case the involuntary nervous system.

Case II: A married man, aged forty-two years, was admitted to the Alfred Hospital for an operation on his shoulder. He was an intelligent person, a builder by trade. After the operation (performed by Mr. E. T. Cato) he could not pass urine for five days and the bowels remained obstinately constipated. On questioning he stated that he had become progressively more constipated during the preceding seven years following a period of great domestic worry and ill-balanced diet whilst working in the country. He had taken enormous amounts of salts and calomel and recently had resorted unsuccessfully to enemata. The bowels would remain unopened for a week or more until he became most uncomfortable, suffering from abdominal pains, headache and giddiness. His condition became an obsession, so that he could think of nothing else. On examination he appeared to be very nervy and tremulous, thin and introspective. The abdomen appeared to be normal. The examining finger found the rectum to be full of fæcal masses. An opaque enema did not disclose any abnormality in the colon.

Operation was undertaken on June 3, 1928, with some misgivings. The lumbar splanchnic nerves were divided as described above. Convalescence was uneventful. Voiding of urine was performed without any trouble. There was no dramatic change as regards defæcation, but enemata were more successful. Some months later the patient stated that he was having much less trouble with his bowel function. He then disappeared and has not been traced.

This patient was not definitely suitable for the operation. He had no dilatation of the colon. The fact that he had retention of fæces in the rectum and that following an operation on the shoulder he had prolonged retention of urine decided the author to make the attempt. That there was no retention of urine after this and that the bowels were undoubtedly easier to manage showed that it was probably not altogether in vain; that possibly something had been done to remove a reflex nervous inhibition of evacuation which may or may not have been one aspect of the "neurasthenic" state.

For the following notes the author is indebted to Mr. S. G. L. Catchlove, who was in charge of the patient.

Case III: A spinster, aged fifty-five years, consulted Mr. Catchlove in July, 1930, complaining that she was subject to attacks of diarrhœa which had occurred frequently for about two months past. Questioning elicited the fact that she had become more and more constipated during recent years and that between the attacks of diarrhœa no solid

fæces were passed. She had lost weight, her appetite was poor and there was a good deal of abdominal discomfort. Examination showed that the patient was very thin, with pronounced abdominal distension. Rectal examination disclosed ballooning of the rectum. Radiological examination showed that the colon and rectum were very dilated.

The diarrhœa which had caused the patient to seek relief, was obviously of a spurious type and secondary to fæcal retention. Purgatives and enemata had but little effect upon the latter, and Mr. Catchlove decided to operate for the relief of the constipation. He was kind enough to invite the author to be present and assist at the operation, which was practically that which has been outlined above. On opening the abdomen the colon was found to be very dilated, its walls being smooth, thin and almost translucent in appearance and quite inert. Indeed, the sigmoid loop resembled a distended pig's bladder. After section of the lumbar splanchnic nerves and removal of part (probably) of the inferior mesenteric ganglionic network there ensued almost immediately a striking change in the appearance of the lower colon. It shrank visibly, its wall became wrinkled and thicker, and the translucent appearance was lost. Peristalsis was not observed, but pinching of the gut wall evoked a localized ring of contraction.

Convalescence was uneventful. There was never any trouble with defæcation. Eight weeks later the patient stated that defæcation was regular, but that she took one purgative pill ("Alophen") each week. She had gained in weight and was very pleased with herself. Three months after operation she developed an acute intestinal obstruction, which unfortunately caused her death. At operation undertaken for the relief of the condition a coil of jejunum was found to have become strangulated by an omental band and to have ruptured.. The colon was quite collapsed and in all respects normal in appearance.

Neither before nor after the primary operation was there any abnormality in the act of micturition.

It is of interest at this juncture to summarize and discuss the more striking points dealt with in the above case notes. Three patients complained of obstinate constipation, and two were shown to have very greatly dilated colons. Two had in addition a tendency towards retention of urine as well as of fæces. This observation is noteworthy, as it appears to support the theory of a nervous origin for certain types of constipation. The rectum and bladder both develop from the cloaca and are innervated by the same nerves. Hence a nervous derangement leading to retention of fæces might conceivably cause some degree of retention of urine. As a result of section of the lumbar splanchnic nerves constipation ceased to be in those patients with dilated colons, whilst the condition of the third was much improved. The tendency to retention of urine exhibited by two disappeared and in the woman gave place to a tendency in the direction of incontinence, although this was never very troublesome and soon caused no anxiety. In one case reported by Wade and one by Judd and Adson in which the bilateral operation was performed, no loss of control of micturition resulted. Probably the hypogastric nerves containing practically all of the lumbar visceral fibres to the bladder have been destroyed frequently in the course of operations such as excision of the rectum. The calibre of the gut decreased as a result of the operation in those individuals with very dilated colons. In one of them the gut was seen at operation to shrink actively and take on a much more tonic and wrinkled appearance. This observation was confirmed at a subsequent operation. So far as could be ascertained visceral sensation, both bowel and bladder, was not impaired.

Summary.

Reference is made to the pioneer work of Royle and Wade in the treatment of constipation of the Hirschsprung type by surgical measures. It is pointed out that the descriptions of the abdominal involuntary nerves which appear in standard text books of anatomy are confusing and do not conform to the plan of the system in animals as known to physiologists. This plan is described and an endeavour is made to show that it holds good in man.

The influence of the extrinsic nerves upon the movements of the colon is discussed briefly.

Reference is made to certain phenomena which have been observed in animals and man, which suggest that possibly certain types of constipation, including that seen in Hirschsprung's disease, may be explained as follows: As a result of abnormal reflex activity affecting the arcs of the lumbar sympathetic outflow the musculature of the colonic wall is inhibited and at the same time the retaining sphincters are more active than normal. The abnormal reflex activity may be excited by some pathological state in the gut or elsewhere in the body acting as focus for the generation of sensory impulses, or more probably the arc itself is abnormally sensitive so that it reacts in an exaggerated fashion to stimuli which would as a rule produce but little effect. It is further possible that this abnormal sensibility is secondary to some abnormality of control of the reflex by fibres from the hypothalamus, which may normally exert an inhibitory influence over the involuntary splanchnic arc, much as the pyramidal fibres moderate the voluntary somatic reflex effects. Diminution of this hypothalamic control might be expected to result in exaggerated reflex effects. In other words, the normal inhibition of inhibition may be defective. Lastly, it is possible that the local nervous derangement is but part of a widespread condition akin to neurasthenia. It is pointed out that there is sometimes a tendency towards retention of urine in addition to retention of fæces, which may be explained in a similar way.

Whatever may be the explanation, if the retention of fæces is due in the last instance to excessive reflex activity in the region of the lumbar sympathetic outflow, then section of fibres entering into the formation of the arcs concerned should destroy the reflex arc, abolish the nervous effect and leave the muscles of the colonic wall free from active interference.

A new operation designed to effect this "release" of the gut is described. It differs in certain respects from those of Wade and Judd and Adson. Reports of three cases in which the operation was performed with satisfactory results are included and discussed.

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(2) R. B. Wade: "The Operative Treatment of Hirschsprung's Disease: A New Method with an Explanation of the Technique and the Results of Operation by N. D. Royle," THE MEDICAL JOURNAL OF AUSTRALIA, January 24, 1927, page 138.
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(8) J. N. Langley and H. K. Anderson: "On Reflex Actions From Sympathetic Ganglia," *Journal of Physiology*, Volume XVI, 1894, page 410.
(9) J. N. Langley and H. K. Anderson: "The Constituents of the Hypogastric Nerves," *Journal of Physiology*, Volume XVII, 1894-5, page 177.
(10) R. B. Wade: "Congenitally Dilated Colon or Hirschsprung's Disease," *The Journal of the College of Surgeons of Australasia*, Volume III, July, 1930, page 3.
(11) Fellner: *"Wiener Medizinische Jahrbuch,"* 1883, page 571.
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(13) W. M. Bayliss and E. H. Starling: "The Movements and Innervation of the Large Intestine," *Journal of Physiology*, Volume XXVI, 1900, page 107.
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Addendum.

Since the foregoing paper was forwarded to the journal the operation has been performed in two additional cases. In both the result has been most pleasing.

CASE IV: A woman, aged sixty-five years, complained of constipation associated with attacks of abdominal pain. Nine years before she had fallen, hurting her back, and since then had never been well. She developed joint troubles, apparently of the nature of rheumatoid arthritis, was treated by several physicians in turn without much relief, and eventually became more or less bedridden. For the last two years the joints had been less troublesome, but attacks of abdominal pain and constipation had come to dominate the picture.

At the onset of an attack the patient experienced pain low in the back and a feeling of nausea. Next followed a "murderous" pain in the abdomen, worse on the left side, persisting for a day or more, but with severe exacerbations, apparently of a colicky nature. Profuse sweating usually occurred. On one occasion the patient felt as though something had swelled up to the point of bursting, when the feeling suddenly went. The attacks had no relation to meals, and had become more frequent until for the past two months there had been little relief.

The bowels were difficult to regulate. Purgatives were usually ineffective, but laxative pills were sometimes followed by the passage of two or three fluid stools, hardly ever formed stools. Enemata were often retained, and on one occasion three successive enemata (in all six pints) failed to return. On examination the patient was seen to be mentally very intelligent (she wrote for a newspaper), but somewhat neurotic. Here general appearance was normal for her age. Examination of the nervous system showed that there were no signs of organic disease. The systolic blood pressure was 200. The abdomen was prominent and somewhat difficult to palpate. Palpation in the left iliac fossa evoked splashing sounds. The rectum was felt to be ballooned. The urinary tracts were apparently normal and excretion of dye from each kidney was good. Radiological examination disclosed a very dilated atonic colon.

Operation was resorted to on March 24, 1931. The colon was found to be very dilated throughout, but contracted weakly on pinching. The appendix contained fæcoliths, and there was a small cyst in the left ovary. In the wall of the descending colon and sigmoid there were numerous minute white nodules, apparently in the muscle coat, not resembling carcinomatous nodules. It was thought that they were lymphatic thickenings. The contents of the colon appeared to be mainly gas and fluid.

The origin of the inferior mesenteric artery was exposed and a stout nerve trunk passing backwards and upwards on each side of the aorta was divided. Several minor bundles passing vertically up in front of the aorta and others on the left wall of the aorta were destroyed. The appendix was removed. The colon was then inspected and was found to have diminished in calibre and to present a more tonic and "ringed" appearance. Pinching evoked a much more rapid and active response than before. Weak faradic stimulation of the distal end of the divided nerves did not appear to affect the colon. The peritoneum was then repaired and the wound closed.

Convalescence was uneventful except that on the night of March 26, 1931, the patient passed urine into the bed. The bowels soon became more active. On June 13, 1931, the patient reported that she was much improved in health. With very little medicinal aid the bowels functioned well, and formed stools were passed. There had been no recurrence of the old pain or vomiting. The patient was very well pleased with her progress.

The impression left in this case was that section of the inferior splanchnic nerves effected an immediate "release" of the colonic musculature, as seen at operation; slightly lessened the effectiveness of the retentive mechanism of the bladder, as shown by the involuntary passage of urine two days after operation; greatly improved the condition of the bowel as regards defæcation, as shown by the comparative ease of regulation and the character of the stools; and lastly, led indirectly to a vast improvement in the state of health and comfort of the patient.

CASE V, a case of Hirschsprung's disease:[1] A girl of 19 years of age had suffered from severe constipation and abdominal distension from infancy. She had been treated by many physicians with but very moderate success, and of late had been much worse. Examination revealed that she had a colon of enormous dimensions, the descending part being quite fifteen centimetres (six inches) in diameter. It was difficult to provoke a bowel action by any means whatever.

Operation was undertaken on April 24, 1931, and the inferior splanchnic nerves were divided near the origin of the inferior mesenteric artery. Convalescence was uneventful. Two weeks after operation it was apparent that the bowels were more responsive to enemata, and soon after evacuation occurred once or several times daily without any medicinal interference. At the present time the patient is very well and formed stools are passed several times daily as a rule.

HODGKIN'S DISEASE: A TREATISE.

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PART II.

Morbid Anatomy.

A STUDY of the morbid anatomy of Hodgkin's disease reveals a ubiquitous anatomical distribution of lymphomatous masses. This will be clearly understood in our subsequent discussion on histology.

Gowers,(1) in a paper presented in 1879, showed that the lesions associated with Hodgkin's disease occurred in lymph glands, spleen, skin and inter-

[1] This is a preliminary note only. More detailed notes of this case will be published at a later date.

muscular tissues, brain, palate, pharynx, tonsils, stomach, intestine, œsophagus, peritoneum, pancreas, thyreoid gland, thymus, trachea, lungs, diaphragm, pleura, heart, pericardium, kidneys, suprarenals, testes and ovaries. To this formidable list of anatomical sites must still be added the nervous system which Ginsburg[2] found to be involved in ten patients out of thirty-six; the bone marrow which Symmers[3] considered to be involved in every case, and bone itself which has been found to be affected in a large percentage of cases by Symmers and Rolleston. Incidentally, it is note worthy that bone involvement has been blamed for the numerous reported cases of paraplegia. This important complication will be discussed later.

Longcope,[4] in reporting his series of cases, states that no organ of the body is exempt from the formation of these lymphomatous masses which, as has been stated, is the essential pathological feature associated with Hodgkin's disease. Therefore the morbid anatomy found, as Longcope suggests, is essentially the enlargement of some group or groups of lymph glands. In addition, small lymphomatous masses arise in the tissue of various organs, either as single or multiple nodules. These masses always appear as distinct growths and are not of the nature of true metastases.

Rolleston[5] found that as a general rule the same set of lymph glands was affected on both sides of the body, but the enlargement was generally greater on one side than on the other, and occasionally the disease affected one side of a particular group of glands. The enlarged glands are either soft or firm, and softness or firmness has no relation to the size. On section, the colour of the enlarged gland, according to Rolleston, is greyish-white with red spots denoting hæmorrhagic points. Seldom are degenerative changes seen, although necrosis does sometimes occur. In the neck, which group of glands Burnham[6] found involved in 86·1% of his cases (the supraclavicular group being affected most), there are secondary mechanical effects due to the enlargement of the glands. The larynx may be pushed to one side, the trachea constricted, the internal jugular vein compressed and the recurrent laryngeal nerve may be rendered functionless. In the thorax and mediastinum the glandular lesions have been observed by Burnham in 71·5% of cases. Once more the mechanical interference is observed and the heart and lungs may be pushed out of place by enlarged glands. Rolleston states that bronchi are often compressed. Growths frequently extend into the thymus gland or even into the lungs. In rare cases, according to Rolleston, vertebræ may be invaded by growth, but the aorta, thoracic duct and œsophagus are seldom compressed. Enlarged abdominal glands were found to be present in 6·1% of Burnham's cases. Pelvic glands have been found to be so enlarged as to compress the uterus. There is a record of an instance in which the common bile duct has been occluded by tumour formation at the *porta hepatis*. Inguinal glands, of course, are frequently enlarged and the effects of local pressure have been recorded. Woodhead[7] describes the naked eye appearance of the lymphadenomatous tissue as follows:

> The lymphadenomatous tissue in the lymphatic glands is firmer than and not so liable to caseate as that in the viscera, otherwise the growths are identical in both naked eye and microscopic appearance. It occurs as either small, firm, elastic masses, or as large pinkish-white nodules, though in the liver, spleen and kidneys (especially when there is a tendency to caseation) there is a yellow tinge from the beginning and the tumour is doughy or even putty-like. Woodhead describes the morbid anatomy of the liver affected by Hodgkin's disease. It is an enlarged, smooth and pale organ containing pale-pink or grey nodules which mainly affect the portal canal and spread thence into the lobules. When the nodules are large they assume a greyish colour, are tough and sometimes caseate. The masses vary in size from a pin's head to a small marble.

The same author describes the spleen as being universally and symmetrically enlarged, though not, as a rule, being greatly enlarged. On section the general surface has a deep red colour and scattered over the section there are numerous small, irregular, translucent yellow masses like small pieces of suet. The masses vary in size and shape. The Malpighian corpuscles and the adenoid sheaths also become involved, with the result that large tumour masses of adenoid tissue are also found.

Osler,[8] describing the morbid anatomy of Hodgkin's disease, draws our attention to the pressure effects produced by the enlarged glands. In addition, however, he mentions that the spleen is enlarged in 75% of cases and that the marrow of the long bones may be converted into a rich lymphoid tissue. The lymphoid structures of the tonsillar ring and of the intestines were found to be markedly hypertrophied in some of his cases.

A synopsis of the morbid anatomical changes can probably be presented most conveniently by quoting a short account given by two observers. The first description is selected from the reported *post mortem* examination by McNalty.[9]

> The skin was of a greyish-yellow hue, the body was anæmic and the limbs were much wasted. There was a marked œdema of the thighs, legs and vulva.
>
> *The External Glands*: There was a marked enlargement of the following groups: upper and lower cervical and submaxillary on the left side; both axillary and inguinal glands. There was no involvement of the upper cervical and submaxillary glands on the right side. (The glands on both sides of the neck are frequently involved, but one side is usually affected secondarily to the other.)
>
> *The Internal Glands*: There was a great enlargement of the lumbar glands with much interstitial fibrosis and a direct granulomatous invasion of the body of the third lumbar vertebræ. Discrete enlargement of the glands was noted at the root of the mesentery of the small intestine and in the cœliac, pancreatic and gastro-hepatic glands. Enlargement of the inferior mesenteric glands was observed, but there was no enlargement of the peripheral, mesenteric glands. With regard to the intrathoracic glands, all the mediastinal glands displayed gross enlargement with some interstitial fibrosis, and the bronchial glands in the hilum of the lung were enlarged. On section all of the involved glands were firm, grey and fibrogranulomatous; some exhibited isolated areas of greyish or yellowish granuloma, others minute yellow necrotic areas. More rarely the glands were completely fibrous.
>
> The spleen was markedly enlarged and showed many small and one hard baked nodule. In the right ureter there were granulomatous nodules which had given rise to

obstruction. Close to the bodies of the vertebræ (thoracic) appeared granulomatous invasion of the parietal pleura, and one large nodule was displayed on the left parietal pleura. Double pleural effusion was present and the lower lobe of the left lung was partially collapsed. The heart showed brown atrophy and a certain amount of pericardial effusion was present. Further features were gross ascites and gross œdema of the liver and kidney. The latter also displayed a moderate degree of hydronephrosis. A large quantity of clear yellow fluid was present in the pericardium. Ascites was a marked feature and there was extreme general anasarca. The liver and kidneys were œdematous and the right kidney, as a result of obstruction caused by the granulomatous nodules, displayed a moderate degree of hydronephrosis. The tonsils were fibrosed with inspissated pus present in the tonsillar crypts. In this case there was a red marrow throughout the femur. The marrow of the long bones in some cases is converted entirely into lymphadenomatous tissue. There were no nodules in the liver or kidneys, but sometimes nodules similar to those found in the spleen in this case may be found in these organs.

The second selected summary of *post mortem* findings is taken from the case described by Letulle, Trémolières and Monssoir.[10] Herewith is a translation of their findings.

In the first place the impossibility of finding any superficial lymph glands must be noted. These had been broken down by the action of X rays. The liver was a rosy beige colour and showed no marked increase in size. The cut surface under Glissan's capsule appeared to be studded with small whitish grains like sago. The spleen was enormous, weighing seven hundred grammes, and its surface had a milky appearance. On section the pulp showed a structure resembling numerous rice grains grouped in clumps and separated from each other by a pinkish reticulum. The lungs, pale in colour, were tesselated, especially at the edges, with numerous white infarcts having the appearance and hardness of cartilage. The appearances were most marked in the thin outer edges of lung tissue. Macroscopical section failed to disclose any metastatic nodules in the deeper portions of the lung. The whole mediastinum had resolved itself into a huge mass of glands adherent to the pericardium. The kidneys were larger than normal. The right one weighed two hundred and fifty grammes, the left two hundred and sixty grammes. Both the cortical and the interpyramidal tissues appeared hypertrophied. The right kidney showed a hard white mass the size of a pea, resembling those in the lung. The kidney surface was granular. All the abdominal lymph glands were massed into one large hard tumour. The mesentery of the small intestine was studded with small, hard, white masses varying in size from that of a pin point to a walnut. The mesenteric glands were enlarged and hard, and formed an agglutinated mass the size of an orange. No iliac glands were found. The peritoneum is normal. The thyreoid gland and testes were normal. There is marked ascites present and a less profuse double pleural effusion. The heart, pericardium, alimentary tract and neck appear normal.

Finally, we must refer to Ewing,[11] whose rather revolutionary ideas with regard to the classification of Hodgkin's disease with allied conditions will be mentioned later. Ewing describes the changes observed in the various clinical types.

1. Acute cases with fever, swelling of cervical and axillary nodes and spleen and general swelling of the lymph glands, nodules in the liver with focal necrosis, cutaneous ulcers.

2. Chronic generalized lesions. The cervical nodes are usually involved and thoracic and abdominal glands, spleen, liver and bone marrow are secondarily affected. Deposits in lungs and serous membranes are observed and all lymphoid tissue can be selected for lymphomatous overgrowth.

3. Splenic Hodgkin's disease: In this we meet the well known porphyry spleen. Primary enlargement of the spleen, however, is considered very rare, although secondary splenomegaly is common. In some cases a spleen of considerable dimensions with necrotic foci is seen in association with enlarged lymph glands, either superficial or deep.

4. Gastro-intestinal Hodgkin's granuloma, which closely resembles either tuberculosis or lymphosarcoma.

5. Mediastinal tumours which again closely resemble lymphosarcoma and are associated with the pressure effects described above.

6. Abdominal Hodgkin's disease, beginning either in the mesenteric or retroperitoneal glands, and in some instances involving the spleen, lungs, liver, bone marrow and superficial lymph glands.

7. Bone marrow lesions, which have already been described.

8. Dermal lesions, excoriation, scarring, pigmentation, bullous eruptions and lesions resembling *mycosis fungoides*.

9. Typical lesions occasionally met with in all other organs of the body.

From the foregoing it is obvious that a limited description of lesions met with in Hodgkin's disease is all that is possible in a work such as this. Volumes could be written on this aspect alone, but a thorough description of the morbid anatomy very accurately recorded by so many observers would necessitate considerable repetition, and we therefore consider that this brief survey will suffice to emphasize practically all the possibilities that might be encountered at autopsy.

Histology.

Whatever organ of the human body may be attacked by Hodgkin's disease the specific histological structure of the lesion is constant. Having previously described (*vide supra*) the ubiquitous distribution of lesions, we consider a detailed account of the histology of nodules occurring in each affected organ would be an unnecessary repetition. The only variations found in the histology in the different organs are those which one would naturally expect as a specific reaction to a lymphadenomatous foreign body nodule in each organ. Hence we shall confine ourselves to the histology associated with the lymph glands, stressing the fact that each microscopical or macroscopical nodule seen throughout the body has essentially the same structure.

The Vienna school recognized this characteristic picture very early. Sternberg[12] described it in a group of cases in most of which he found tubercle bacilli. In 1899 he established the fact that Hodgkin's disease was an histological entity, and considered that the changes in the lymph glands and elsewhere consisted of a connective tissue reticulum supporting variable numbers of lymphocytes, together with mononuclear and multinuclear giant cells, with or without an admixture of eosinophile cells. Virchow[13] laid great stress on the pathognomonic lymphadenoma cell, a smaller and rounder cell than the giant cell of tuberculosis, a cell which contains fewer and more centrally placed nuclei.

A few years later both Andrews and Reed gave a detailed account of the histological characters of lymph glands found in all stages of the disease. A synopsis of the work by Andrewes[14] is as follows:

The normal structure of a lymph gland with its cortex showing follicular germinal centres and with its reticulum obscured by lymphocytes is altered in the following manner:

1. The lymph gland assumes a homogeneous appearance. Its structure is obscured, but simplified in that the distinction between cortex and medulla is abolished.
2. The number of lymphocytes is apparently diminished. They no longer conceal the supporting framework of the gland.
3. Along with the diminution of lymphocytes there is hyperplasia of the framework itself, the fibrillar reticulum is conspicuous and its increase may amount to actual fibrosis. The endothelial cells in the reticulum are very numerous and some attain a large size and may have one or more large deeply staining nuclei. (These are the cells already mentioned by Virchow as lymphadenoma cells.) They are not always uniformly distributed, but are sometimes more numerous at special places. Some of them contain large karyokinetic figures and display many points of difference from the giant cells of tuberculosis.
4. Eosinophile cells are always demonstrable in the glands, but they are not always present in increased numbers. The general features described by Andrewes are those of diffuse overgrowth of the glandular framework and real diminution of lymphocytes. In glands which are hard on clinical palpation, there is considerable fibrosis and the lymphadenoma cells are scanty. In soft glands the reverse is found. Incidentally it may be mentioned that Andrewes considered that the epithelioid cells of tuberculosis have an endothelial origin, and he considers the histology of tuberculosis and of Hodgkin's disease alike in that each process has for its foundation endothelial proliferation, but here he thinks the comparison between the two diseases ends.

The foregoing synopsis of Andrewes's conception of the histology in this disease is very simple and can be understood by a fourth year medical student. In the majority of cases the terms of his clear and detailed account can be applied today, but unfortunately there are cases met with very occasionally when diagnosis would still remain obscure if we follow Andrewes alone. These are the conditions that worried Ewing and which have led to his insistense on grouping so many morbid conditions found in lymph glands irrespective of their histology. This classification will be referred to later.

Let us now refer to the histological pictures described by Dorothy Reed.[15] The description is more detailed than that of Andrewes.

Reed describes first of all changes met with in the smallest, which by inference would be the most recently affected glands. In these there is a mere proliferation of the so-called endothelial cells of the reticulum covering the lymph sinuses, also a proliferation of the large cells of the centres of the lymph glands which are presumably the same cells. Mitotic figures are often seen in these proliferated cells and dilatation of the blood vessels and lymph sinuses is a marked feature in this early stage. As the process develops, lymph sinuses and reticular spaces are filled with masses of lymphocytes and proliferating endothelial cells. Furthermore, these cells destroy the normal appearance of the gland and obliterate the distinction between follicles and sinuses. The endothelial cells may show karyokinetic figures. Numerous giant cells with one or more nuclei and prominent nucleoli appear. Occasionally there is seen a very large giant cell with small numerous peripherally arranged nuclei like the giant cell of tuberculosis. The origin of this cell, according to Reed, is by no means the same as the origin of the multinuclear endothelial cell. The lymphoid cells, which are in the early stages very numerous, are of the usual small type. Reed considers these cells are also derived from proliferation of the endothelial cells. Plasma cells are often as numerous as lymphoid cells. Eosinophile cells are usually abundant throughout the tissues, except in the germinal cells of the follicles. As the process develops the connective tissue shows marked proliferation. The framework of the gland increases and the bands of connective tissue often break up the gland into coarse lobules. The connective tissue increase causes proliferation of lymphocytes and plasma cells. The tissue which before was rich in cells now undergoes fibrous transformation. Periarterial fibrosis obliterates the hitherto numerous blood vessels.

Next we find large, anæmic, necrotic areas with degenerated cells surrounded by connective tissue, and the connective tissue itself undergoes hyaline changes. The clinically soft, recently affected gland is very cellular, whereas in the hard type there is extreme fibrosis.

Dorothy Reed gives her views of the histogenesis of the cells. She considers that the endothelial cells arise from the fibrils of the reticulum. The free cells or mother cells of the germinal centres of the lymph nodes furnish by their proliferation the small lymphoid cells of the gland. Hence in the connective tissue cells of the reticulum we have the endothelial cells lining the lymph sinuses of the gland, the larger lymphocytes or mother cells representing different stages of the same embryonic spider cell. The abundance of connective tissue in turn has a dual origin. It arises from proliferation of connective tissue around the blood vessels and also from transformation of proliferated endothelial cells into fibrous tissue. The large giant cells are formed from these proliferating endothelial cells which, by the way, are not true endothelial cells and are not identical with the endothelium of blood vessels.

Transitional forms from epithelioid cells to large mononuclear cells and from these to giant cells with one or more nuclei have been identified. The lymphoid cells so abundant in young growths are usually of the small type. They seldom show karyokinetic figures. Reed considers that lymphoid cells arise from proliferation of the mother cells of lymph glands and presumably from the endothelial cells of the reticulum, which are analogous. Plasma cells are probably the result of a proliferation of similar type as that forming lymphoid cells, and they may be commuted themselves into connective tissue. The eosinophile cells are most likely the normal eosinophile cells of the blood stream attracted to lymph glands, and they are never seen in the germinal centres of the follicles.

Reed also describes the giant cells similar to those found in tuberculosis, and also endothelial phagocytic cells. She further states that the metastatic nodules consist of exactly the same cellular structure as the glandular growth.

Our readers may consider that surely we have considered the histology in sufficient detail, but as we intend to advance an hypothesis later, we must crave indulgence for the repetition of the histological findings of one more universally recognized authority.

W. T. Longcope, after an accurate and most detailed account of eight cases, summarizes his observations of the histology of affected glands as follows: The earliest changes in the smaller glands are as follows: Hyperplasia of lymphoid cells with active proliferation of germinal centres; increased vascularity and proliferation of the reticular endothelium; mitotic figures are present in the reticulum. Eosinophile cells, epithelioid cells and large mononuclear cells are present in the lymphoid sinuses. The reticulum becomes coarser. The normal structure of the gland is lost. Lymphoid follicles disappear. Lying in the reticular network are found polymorphal cells, eosinophile cells, epithelioid cells and giant cells. The giant cells are often the most conspicuous feature of this stage.

Longcope agrees with Reed as to their origin through the epithelioid cells to the endothelium of the reticulum. He considers also that the multinuclear giant cells are formed from the mononuclear. He only met with the giant cell resembling the tnuberculous giant cell in two of his cases. He suggests that besides giving rise to the simple giant cells the epithelioid cells may by their rapid division form a syncytium. He describes cellular degeneration and

resulting necrotic areas. Longcope also found that the late stages of the disease manifested in glands most completely converted into fibrous tissue, which he thinks is not a healing process.

In some of his cases he observed an attempt to regenerate lymph glands, but the young lymphoid structures were rapidly converted into lymphomatous nodules. This series of changes was also observed in tissue altogether outside the lymph glands.

Longcope advances a theory which is important and must be considered alongside our own hypothesis to be enumerated later, that preexisting lymph glands are rendered functionless. New glands are formed and then become involved in the general lymphatic destruction. Longcope further suggests that in Hodgkin's disease there is a demand upon the bone marrow for an over-production of eosinophile cells. He therefore supports Ehrlich's theory for their existence—the theory of chemotaxis.

Turnbull and others have added knowledge to the histology, but we shall not repeat the details.

Before, however, enunciating our own hypothesis concerning the histology of Hodgkin's disease and its relation to similar diseases not displaying these pathognomonic histological features, we wish to quote three more authorities on a slightly different aspect of these pathological conditions found in lymph glands.

It is obvious from what we have said that Hodgkin's disease can be determined by a special and characteristic histological picture. We will accept as convenient the latest conception of this specific histology, namely, that given by Longcope, but are we to exclude all cases of disease in lymph glands not producing the histological picture so carefully outlined? How can we explain those obviously malignant tumours that do give the exact histological picture in one or more stages as outlined by Longcope? Hence we turn to three more references before stating our own theory.

First, Rolleston,[16] in dealing with the morbid anatomy of Hodgkin's disease, states:

The most striking feature of the morbid anatomy of Hodgkin's disease is the enlargement of the lymphatic glands. In health the lymphatic glands may be divided into primary, secondary and tertiary groups. Of these the primary and secondary are always to be found, whereas the tertiary glands are usually so small that they may escape observation, but they become enlarged in special circumstances. The inguinal glands are a primary group, the popliteal are secondary glands. Dr. Gulland states that in the axilla there are tertiary glands which ordinarily measure one or two millimetres only in diameter, but which in women during lactation become temporarily enlarged. They afterwards disappear, as Mr. Stiles has found, by a process of fatty involution. These tertiary glands may also become enlarged if carcinoma develop in the mamma.

Sir Humphery Rolleston also states:

The greatest difficulty is the clinical differentiation of Hodgkin's lymph-granuloma from lymphosarcoma and the closely allied malignant lymphocytoma composed of small lymphocytes, and from endotheiial sarcoma. I have seen cases apparently running the clinical course of Hodgkin's granuloma show these histological appearances finally; the question arises whether, as probably most would consider, these conditions have existed from the start or whether they have supervened as a result of Hodgkin's lymphogranuloma.

Our second quotation is from Ewing. In dealing with tumours of the lymph glands Ewing states that:

Classified according to present indications of histogenesis, tumours of the lymphoid tissue appear as follows:

Origin.	Anatomical.	Clinical Type.
Lymphocytes	Lymphocytoma.	Simple and tuberculous lymphoma. Pseudo-leuchæmia. Malignant lymphocytoma.
Reticulum cells	Large round cell hyperplasia or neoplasia.	Malignant granuloma. Myeloid leuchæmia. Hodgkin's sarcoma. Large cell lymphosarcoma.
Endothelial cells	Endothelial hyperplasia or neoplasia.	Endothelial hyperplasia of tuberculosis. Endothelioma.

Again, Ewing states:

In some cases I have been unable to separate the local cervical or axillary tumours (speaking of endotheliomata of the lymph glands) from a systemic disease of the type of Hodgkin's granuloma.

Further, he states:

A peculiar form of endothelial hyperplasia may occur which exhibits some of the morphological and clinical features of a neoplasm. These cases may occur in the group of chronic enlargements of the lymph nodes of uncertain origin and they pursue the course of Hodgkin's disease, but specific Hodgkin's structure and specific signs of tuberculosis are missing.

On the same page we find Ewing discusses the histology of the spleen in primary splenomegaly (type Gaucher) with its agglutination of polyhedral cells occluding and replacing sinuses, scattered lymphocytes, occasional mitoses, rare necrosis, but ultimate fibrosis. He states that in the lymph glands and marrow much the same process is observed beginning in the sinuses. Ewing's classification of endotheliomata and lymphosarcoma is well known. He states:

Thus arise two types of lymphosarcoma which may be designated as: (1) reticulum cell sarcoma or large round cell lymphosarcoma, (2) malignant lymphocytoma.

Ewing also discusses the sarcomatous type of Hodgkin's disease, saying:

The transformation of Hodgkin's granuloma into a sarcomatous process occurs in a certain proportion of cases and since the new cells are of endothelial origin this tumour might be classified with endotheliomata.

Our third and last reference is to William B. Coley.[17] Coley considers that many cases of Hodgkin's disease and lymphosarcoma bear such close resemblance to each other that it is impossible to differentiate them clinically or histologically. He considers it more rational to regard even the clinical and histological cases as varieties of the same disease—lymphoblastoma.

Now we shall endeavour to review the definite histological pictures drawn by Reed, Andrewes, Longcope and others and try to correlate these findings with the statements made by Rolleston, Ewing and Coley, all of whom, in spite of pathognomonic histological data, still require extra help for diagnosis in certain cases. Cannot all these allegedly aberrant cases be explained? Cannot we correlate

all these views enunciated by such great research workers? We suggest the following hypothesis as one that will embrace all cases and explain why Hodgkin's disease would appear to some as a benign inflammatory condition, whilst to others it appears to be a new growth, and even to a third school of thought appears to be at times an inflammation and at other times to behave as a neoplasm.

We know that the essential change in the lymph glands is a proliferation of the endothelial element. We conclude that this proliferation is stimulated by the toxins elaborated by the avian tubercle bacillus. Whether lymphosarcoma is the same disease or not, we know that once again the essential feature is a proliferation of certain elements. In fact, in all diseases tabulated by Ewing (see table above) there is essentially present proliferation of some element in the lymph gland. This proliferation evidently, as Longcope suggests, renders the affected lymph gland functionless and other lymph glands (no doubt the tertiary lymph glands) hitherto very small, now come into function as a reserve. These in turn become affected and their function is lost. We know also that in many of the anæmias, leuchæmias *et cetera* there is first of all a proliferation of some element in the spleen. We mention the very analogous sequence of events described by Ewing in the spleen in cases of Gaucher's splenomegaly. We consider with many authorities that at least portion of this proliferation in these conditions is physiological, but we suggest that the function of the particular cells, when proliferation becomes extreme, is lost.

It is noteworthy that in very early cases of myelocythæmia (we have personally observed three such cases) the first call is upon the eosinophile cells. We suggest that when the lymphoid elements become functionless, probably the eosinophile cell is called upon to perform a similar function. Now in this proliferation mitotic cells and karyokinetic figures are observed. This would demonstrate very excessive activity on the part of these cells. Fortunately the end result of most of this activity is towards fibrosis. This, however, as Longcope stated, is not a healing process, so can it not be imagined that occasionally these active cells situated in this functionless tissue and associated with an unusual form of fibrosis, will at times be the starting point of malignant neoplasia?

In the Hodgkin's sarcoma not all the affected glands become sarcomatous, but on the contrary we have not found reference to cases where it is necessary to imagine that more than one gland was the starting point of this malignant growth. As Nakamura[18] has pointed out, the spread in Hodgkin's disease is probably from one set of glands to a distant group, and this fact alone finds no analogy in the behaviour of true metastasis in new growth. But when Hodgkin's sarcoma is present, true metastasis can be found and the behaviour of the tumour and its metastasis is similar to all other forms of new growth.

The single case observed by Letulle, Trémolières and Monssoir, in which the aberrant proliferated cells are seen in a state of active division within the blood vessels and spreading beyond them, was surely a case of Hodgkin's sarcoma. This state of affairs is surely an exception to the general rule, as it does not appear in the most detailed histological reports by others. It is in a case such as this that we consider the malignant process has developed in a functionless gland. Lack of normal function of any group of cells associated with active proliferation of other cells in the same tissue can surely predispose to malignancy. Similarly, other conditions, for example, lymphatic leuchæmia, myelocythæmia *et* cetera, which may still be regarded as malignant diseases of a liquid cellular tissue, might commence in this manner.

We wonder if even the fibrous tissue found in scirrhous carcinoma of the breast is the result of Nature's futile effort at repair. It does seem impossible that Nature should try so often and fail every time. Moreover, the fibrous tissue of scirrhous carcinoma and also of Hodgkin's disease is not histologically identical with the fibrous tissue of inflammation. In the former examples one can never find a stage at which there is an active abundance of fibroblasts, whereas this stage is always found in inflammatory tissue. The mere possibility of preexisting fibrous tissue, as in cases of chronic mastitis, being in some way associated with the commencement of malignancy has occurred to us. Similarly, the mere possibility of fibrosis in a lymph gland accompanied by some areas of cellular activity being an assisting factor in starting malignancy may be mentioned. We would go so far as to suggest that the flooding of tissue by reserve cells, such as the cells in the tertiary glands, the cells going to form splenic hyperplasia and the cells pouring into the blood stream in the leuchæmias, could be predisposing factors to malignant growth. Finally, we suggest that the pathognomonic histological picture in Hodgkin's disease does not necessarily separate this condition from the other kindred diseases.

We follow Reed and Longcope in their theories on histogenesis and we conclude that after all this picture is only the natural result of proliferation of the endothelial cells. Other histological pictures may be produced as a result of the natural sequence of events of proliferation of other groups of cells. In fact, we thoroughly agree with Rolleston and Coley in their refusing to separate the two diseases, namely, lymphosarcoma and Hodgkin's disease (and we must remember that Coley has seen cases in which they cannot be separated histologically).

We are inclined to go even further and to include some or all of the many diseases enumerated by Ewing in a common category, all of which commence as the result of some stimulation to proliferation of a certain type of cell, and this proliferation produces specific histological pictures according to the particular group of cells which have been stimulated to proliferate.

Age and Sex Incidence.

Probably the largest number of reported cases investigated by any one worker has been analysed by Burnam. Burnam found that Hodgkin's disease was much more common in males than in females. The figures given are 110 cases male and 55 cases female. The age incidence is represented by Burnam as follows:

Up to 10 years of age	2·45%
Between 10 and 20 years ..	15·33%
Between 20 and 30 years ..	22·10%
Between 30 and 40 years ..	22·30%
Between 40 and 50 years ..	22·10%
Over 50 years of age	15·90%

Variations in Type.

It is obvious from what we have written that we consider it unnecessary and unjustifiable to subdivide a disease the ætiology of which has until recently been in the melting pot and which has been determined by some mainly on clinical data and by others solely by a specific histological picture. We have suggested leaning on the support given by Ewing, Rolleston and Coley that pathologists may have been too dogmatic in their insistence on a special specific histological picture in spite of a typical clinical syndrome, and that clinicians likewise have been misled by refusing to accept a veto to their diagnosis when given on histological grounds. We have already pointed out the relationship this disease bears to many others, and have shown that at times no specific diagnosis could be made even by the most competent observers.

To repeat what has already been written, we have suggested that this disease, the result of the action of the toxins of the avian tubercle bacillus, produces a proliferation of a certain element in the lymph gland and have similarly suggested that allied toxins or even the same toxin may stimulate other elements in either lymph glands, blood stream or kindred tissue to produce proliferation, and consequently we are inclined to group all these conditions in a manner similar to Ewing. Until the specific ætiology of each is determined we do not consider that it is rational to subdivide or classify a group and so produce more confusion.

To give final support to our firm disapproval of classification, which may result in tremendous confusion, we quote from the Cancer Review:[19]

> Von Koranji mentioned several cases showing the clinical pictures presented by lymphogranulomatosis occurring in unusual sites: (1) In one the symptoms and signs, including hepatic and splenic enlargement with ascites, led to a diagnosis of interstitial hepatitis, but later the inguinal glands became enlarged and biopsy of them gave the correct diagnosis. (2) A young man whose brother had died from lymphogranulomatosis, the first sign of the disease was a firm but later fluctuating tumour arising from the second costal cartilage and diagnosed as tuberculous perichondritis until biopsy gave the right clue. (3) An army officer was sent to hospital with a diagnosis of typhus, and the bacterial findings confirmed this; the fever failed to clear up; a lymphogranulomatous deposit appeared in the cervical glands, and death occurred after a period of continuous fever.

Later on in the same page of this journal we find:

> Chevalier also emphasizes the polymorphic character of Hodgkin's disease shown both macro- and microscopically. The presence of Sternberg cells is not pathognomonic, since these cells occur also in soft chancre and in inguinal lymphogranuloma (Nicolas).

And also on the same page we read that Achard considered that it mattered little whether one adopted Hodgkin's or Sternberg's terminology. Hodgkin described a syndrome, Sternberg a lesion, but neither syndrome nor lesion suffices as a basis for naming a disease of which the cause remains unknown. We shall therefore merely briefly outline a few of the variations described.

The first is the Pel-Ebstein variety, which is essentially a lymphadenoma associated with relapsing fever. It is this disease that McNalty has carefully described, and has treated every aspect of the condition in detail, being convinced that it must represent a different disease. We consider it is this condition also that isdescribed in a recent edition of the *Medical and Scientific Archives of the Adelaide Hospital.*[20] Many writers have reported similar cases, and the essential features are those of a Hodgkin's disease running an acute course with an intermittent temperature chart.

A second variety, which is mainly of histological and morbid anatomical interest, is the group of Hodgkin's sarcoma previously described in this paper and emphasized by Ewing. In this group we classify the case described by Letulle, Trémolières and Monssoir. Further grouping can be made on lines adopted by Osler and already discussed, namely, grouping according to clinical phenomena and anatomical sites of lesions.

A final variation of type, to which also reference has been made, is a group of closely allied conditions not giving a typical histological picture and clinically inseparable from cases of Hodgkin's disease.

Signs and Symptoms.

The difficulty in the past of accurately separating Hodgkin's disease from other diseases bearing close resemblance has led to confusion in the reported signs and symptoms. However, there would appear to be a definite clinical syndrome associated with the majority of typical patients in whom the histological picture has been verified. Signs and symptoms are many and varied also on account of the universal anatomical distribution of lesions. We therefore refrain from rewriting the rare atypical phenomena recorded by many observers, but are concentrating on the more typical clinical syndrome. For this purpose we refer mainly to two well known authorities, Osler and Macrae, and Allbutt and Rolleston.

Prodromal symptoms are rare, and in about 75% of cases the disease starts with a painless enlargement of one or more groups of superficial lymph glands. In 25% of cases the onset is insidious and the following symptoms are observed: Fever, loss of weight, anæmia, malaise, or perhaps cough or dyspnœa (if the mediastinum is first affected), or abdominal pain, nausea or diarrhœa (when the abdomen is primarily involved). In some instances a very early symptom is a persistent neuritis due to

the pressure of the abdominal or iliac glands, and yet another early symptom is pruritus. On rare occasions the disease in its initial stages resembles an acute infection, such as typhoid with high fever, abdominal pain and splenic enlargement. It is obvious that symptoms and signs, even in the initial stages, vary with the anatomical distribution of lesions.

In Osler's "System of Medicine" Ziegler[21] is quoted as having suggested a rough differentiation of several more or less definite forms of the disease. These include (*a*) a localized form, (*b*) a generalized form, (*c*) an acute form, (*d*) a mediastinal form, (*e*) a larval form of insidious onset with fever and abdominal pain without superficial glandular enlargement, (*f*) a splenomegalic form, (*g*) an osteoperiostitic form.

All statistics emphasize the frequency with which the enlargement of superficial glands, especially the cervical group, is the first symptom given. The glands increase in size, at first independently of each other, and they remain separate. At first the skin is freely movable over these superficial glands. Later the glands become firmly adherent to each other, and finally they become adherent to the skin, although this is seldom observed except after deep X ray therapy.

In the neck the glands of the posterior triangle are most often affected, especially the supraclavicular and postauricular glands. Very often the glands on one side of the neck first of all become enlarged, then follows enlargement of those on the other side. Whereas it is quite common to observe more or less stationary enlargement of glands in the neck, it is noteworthy that the enlargements in other situations, for example, the axilla or inguinal regions, rarely become localized for long. On the contrary, a rapid spread to adjacent or distant groups is commonly found. In rare cases, that is, those running a very acute course, one group of glands after another enlarges with such rapidity that within a few weeks almost every lymph gland in the body becomes swollen, and sometimes enormous tumours result in a very short space of time.

Far more commonly the progress of the disease is slow, and tumours, usually painless, are observed scattered throughout the body in sites corresponding to the different anatomical lymph gland groups. The separate glands vary in consistence in different cases, that is, they are either hard or soft, and the histological significance of these varieties has been discussed. They seldom break down or ulcerate, and secondary infection within the glands is comparatively rare.

The second stage of the disease is ushered in with symptoms due to mechanical pressure from the enlargement of the glands. For example, in the neck pressure on the trachea gives rise to cough and dyspnœa; on the blood vessels it causes local congestion; and on the recurrent laryngeal nerves it results in the well known brassy cough. Unilateral enophthalmos, ptosis or myosis due to sympathetic involvement has been observed. Besides these symptoms there are recorded exophthalmos, difficulty in deglutition and sixth nerve paralysis.

With mediastinal involvement dyspnœa, cough, dysphagia, pressure on the pericardium actively causing heart failure, œdema due to constriction of the great veins are amongst the commonest symptoms. Especially the left azygos vein should be mentioned because, when it is compressed, hydrothorax may result. Occasionally, as in one of our cases, the pleural fluid is chylous. This fact is interesting because the thoracic duct is very rarely involved in the mediastinal glandular enlargement. Chylous pleural transudate is usually a terminal symptom.

In the abdomen symptoms due to the mechanical effects of glandular enlargement, for example, jaundice, when the *porta hepatis* is the site of lymphatic tumours, neuritis due to pressure on nerve plexuses and local œdema, have been observed. In addition, bronzing of the skin, even without involvement of the suprarenals and directly due to pressure on the solar plexus, vomiting, ascites and symptoms due to compression of the spinal cord causing paraplegia have all been recorded. Pressure on the ureters with the inevitable sequelæ is mentioned in the literature.

The third stage of the disease may be described as that in which constitutional symptoms, combined, sooner or later, with greater lymphatic enlargement and involvement of the spleen and liver, and deposits in other organs, for example, lungs or alimentary tract, dominate the clinical picture. Of the constitutional symptoms fever, asthenia, anæmia, loss of weight and cachexia are the commonest. Itching of the skin, pruritus and intensification of the bronzing of the skin are found. Enlargement of the spleen is not as a rule an early symptom. It seldom reaches enormous dimensions as in leuchæmia, but sometimes its outline is irregular, due to surface nodules of adenoid growth. The liver is sometimes enlarged, the enlargement being due to either fatty degeneration or occasionally to lymphoid deposits. The heart itself is seldom directly involved. Tachycardia, especially when fever is present, and low blood pressure are factors generally associated with the disease. The lungs may be selected for invasion and if the growth extends into them from the mediastinum, consolidation may ensue. In the alimentary system direct involvement is rare. Considerable enlargement of the tonsils rarely occurs. The majority of symptoms, for example, dyspepsia, diarrhœa, obstructive jaundice, ascites, acute symptoms resembling those of typhoid fever, or ruptured gastric ulcer, or more chronic symptoms resembling those of hepatic abscess are all recorded, but seldom are they associated with any lymphoid masses in the alimentary system itself. They are most often due to pressure. Ascites is frequently a terminal event. The kidneys are rarely involved, and symptoms directly due to involvement are rarely found. Pigmentation of the skin and pruritus have already been mentioned. Profuse sweating and urticaria are common symptoms. Erythema, papular

eruptions and cutaneous hæmorrhages are occasionally observed. Actual granulomata resembling the tuberculoids and *lymphosarcomatosis cutis* are unusual, but nevertheless claim mention. Affection of the periosteum and marrow are sometimes associated with local pain.

The central nervous system may be involved primarily or secondarily; pain and tingling associated with pressure on peripheral nerves, facial paralysis, symptoms directly due to erosion of vertebræ, delirium and even coma are amongst the main symptoms and signs mentioned. Fever is frequently found associated with Hodgkin's disease. Three types of fever, according to Gowers, are met with: First, the fever that is customarily raised 1° or 1·5° C. (2° or 3° F.) above normal. Secondly, the fever in which there are alternating periods, often several days in duration, of high fever and of an afebrile state. The third type, where there are daily variations, for example 38·3° to 39·4° C. (101° to 103° F.) each evening, falling to the neighbourhood of 37·8° C. (100° F.) each morning. Some cases, of course, are unaccompanied by any fever throughout their course.

The blood changes are by no means characteristic. Anæmia most often appears early in the disease and is, of course, of the secondary type. Occasionally the anæmia is profound and generalized hæmorrhages, including retinal and hæmorrhages from the mucous surfaces and even melæna are reported. The red cells seldom fall below two million per cubic millimetre and counts around three million are frequently observed.

The hæmoglobin content is usually between 50% and 80%. Nucleated red cells are seldom found. Amongst the leucocytes the eosinophile cells are occasionally increased, especially when accompanied by necrosis in lymph glands. Much more commonly observed, however, is a definite neutrophile leucocytosis. This is especially common in the advanced stage of the disease, and counts varying from ten thousand to twenty thousand per cubic millimetre are often recorded. In one of our early cases there was a neutrophile leucocytosis with a total count of forty thousand, and no concurrent infection was found.

In parenthesis we wish to record an interesting history obtained in one of our cases.

The patient's condition was extremely advanced when first seen by us. She gave the history of being closely associated with a cockatoo for years. This cockatoo had a skin eruption. The patient frequently kissed the bird. The first symptom noticed, even before glandular enlargement in the patient herself, was a skin eruption. The cockatoo died two days before the patient, whose disease was of the acute form and whose history did not extend for a period longer than one year.

We mention this rather interesting history as it was given to us quite voluntarily and may be important, especially in view of our ideas on ætiology. Finally, we enumerate and briefly describe some of the complications and sequelæ met with in this disease.

Complications and Sequelæ.

Most of the complications are so intimately intermingled with the symptoms and signs already described, that they will be omitted so as to avoid repetition. We wish to lay great stress on the paraplegias and cases of myelitis that may arise either due to pressure from the abdominal tumours or as a direct extension into the spinal cord itself. We have personally observed two cases of progressive paraplegia and one case of progressive myelitis. Another very serious complication is the papular skin eruption which may become universally distributed over the body as in the cases reported by Corbett[22] and Sibley.[23] These reports are illustrated and the extensive rash presents a distressing picture in both instances.

Another remarkable case is reported by MacCormac[24] in which there was an extremely severe pruritus present. The pruritus was cured and the lymph glands considerably diminished in size after two injections of the patient's whole blood. The article does not state how the injections were given.

Weber reports interesting complications in his case of *lymphogranulomatosis maligna* with recurrent purpura and hæmorrhagic symptoms. This case resembled chronic septic pyrexia with splenomegaly and purpura. At *post mortem* examination there were numerous necroses in the lymph glands and liver. Weber states that it seems that in fairly chronic and advanced cases of *lymphoglanulomatosis maligna* there are always two processes in progress: (*a*) an acute necrotic process in affected parts, (*b*) a reactive process of fibrosis.

Lastly we must mention the febrile septicæmic complications where the patient presents most of the symptoms and signs of acute septicæmia.

Weber[25] [26] [27] [28] [29] states that:

The pyrexial stage in Hodgkin's disease may be regarded I think as a stage of dissemination or generalization of the disease—a kind of septicæmia of Hodgkin's disease and during which the abdominal viscera in especial are becoming more and more involved.

Weber amplifies this hypothesis as follows. He states that he uses the word septicæmia in the broadest sense, for example, as in gonococcal, pneumococcal and influenzal septicæmia, and he further compares the process of dissemination with that of an acute miliary tuberculosis which sometimes follows an injury to some old tuberculous focus.

Diagnosis and Differential Diagnosis.

As already stated, there is still great confusion in nomenclature and some authorities even now are inclined to group several diseases more or less under one heading, namely, pseudoleuchæmia. Consequently, the various forms of splenomegaly, lymphosarcoma, leuchæmia and true pseudoleuchæmia are extremely difficult to differentiate from Hodgkin's disease, and it is doubtful whether, in our present state of knowledge, it is necessary or advisable to differentiate some of them. Syphilis also may present a picture of lymph gland enlargement, but of

course can be differentiated by the Wassermann or allied serological tests. Local acute inflammatory reactions in the lymph glands should be differentiated by the discovery of the septic focus. Generalized acute or subacute lymphadenitis embracing the diseases such as glandular fever and acute infective mononucleosis, can be differentiated by a full blood count.

Tuberculous lymphadenitis, which is so often mistaken for Hodgkin's disease, can be differentiated by serological tests in children and by biopsy in adults. The histological appearances in the tuberculous glands are not in any way similar to those found in Hodgkin's disease. True splenic anæmia can be identified clinically, as a rule by the absence of palpable abdominal glands, by the absence of ascites or jaundice or many of the pressure symptoms already described, directly due to the presence of enlarged glands in Hodgkin's disease.

To differentiate Gaucher's disease which is incidentally often associated with enlarged superficial glands, is a different matter. The familial occurrence of Gaucher's disease is practically the only guide short of biopsy of the glands which, however, may also demonstrate some resemblance to Hodgkin's disease. In spite of all that has been written about the differentiation of lymphosarcoma from Hodgkin's disease, we are inclined to agree with Ewing by stating that the lymphocytoma type of lymphosarcoma where the lymphocyte and not the endothelial cell is proliferated, can be differentiated at a glance by histological examination. But where the endothelial elements of glands proliferate to produce a so-called lymphosarcoma of the endothelial type, then differentiation either clinically or on histological grounds is practically impossible. In differentiation one relies solely on the appearance of the Dorothy Reed cells and then we consider that a great number of cases of Hodgkin's disease will be classified as lymphosarcoma. Clinical differentiation between these two diseases is well nigh impossible. Leuchæmia can be identified in practically all instances by a blood picture and, as the pseudoleuchæmia of Sternberg is still a disease without a clinical entity, differentiation is impossible.

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Reports of Cases.

OBSERVATIONS ON THE TREATMENT OF HAY FEVER BY ENDONASAL IRRADIATION WITH ULTRA-VIOLET LIGHT: REPORT OF FOURTEEN CASES.

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Cemach, of Vienna, made the following statement in the *American Journal of Physiotherapy*, June, 1929, referring to the treatment of hay fever by endonasal irradiation with ultra-violet light.

> In 75% of 61 cases I obtained complete cessation of all symptoms. Failures are the exception. As a rule 5 irradiations are necessary, but in exceptional cases more are needed. Hay fever is not cured by this treatment, for the attacks generally reappear the following season. Many patients who have had the treatment each year state that there is a gradual decrease in the intensity of the symptoms. In 5 cases the hay fever remained permanently absent and 13 cases remained free for the next season after treatment.

During the past spring and summer I have applied ultra-violet light endonasally in fourteen cases of paroxysmal rhinorrhœa in an endeavour to verify the above. The cases fall into three groups:

Group I: Those whose symptoms were completely controlled throughout the season (five cases).

Group II: Those who responded to a brief course and whose attacks were no longer severe enough for continuation of the treatment (five cases).

Group III: Failures (four cases).

In the following account, unless stated, there was no gross pathological change in the nose or throat.

Group I. Completely Controlled.

Case I: A female patient, aged thirty-three, had hay fever in the spring only for the past six years. She had a course of injections from an allergist with no great benefit. Irradiation was commenced on September 11, 1930, and discontinued on December 31, 1930. This was a test case, and it was found that ten days between irradiations was sufficient to control her symptoms. She had severe symptoms in previous seasons and stated that she was able to walk in paddocks containing the grasses she is sensitive to.

Case II: A female patient, aged twenty-six, had hay fever every spring for five years. For three years she had injections by an allergist with no result. She reported on November 18, 1930, with her nose pouring and excoriated. Three irradiations were given at intervals of a week and no further attacks occurred.

Case III: A female patient, aged thirty-five, had hay fever for the last two springs. Her attacks came in paroxysms and she expected them on north wind days. From November 14, 1930, to December 19, 1930, endonasal irradiations were given at intervals of a week. No attacks occurred.

Case IV: A female patient, aged thirty-six, had paroxysmal rhinorrhœa every spring and summer for five years. Allergic tests showed her to be multisensitive. From October to March endonasal irradiations at intervals of one to three weeks kept her free of attacks. This patient's symptoms were not so easily controlled as those of the others. X ray examination on two occasions revealed fairly gross mucosal thickening in both antra.

Case V: A female patient, aged twenty-one, had hay fever for one season and was just commencing a second season. From October to December endonasal irradiations were given at intervals of one to two weeks. No attacks have occurred since.

Group II. Response to Brief Treatment.

The following five patients responded to a brief course and subsequent attacks were not severe enough to warrant continuation of the treatment.

Case VI: A female patient, aged thirty, had hay fever every spring for four years. She received no treatment. Three endonasal irradiations controlled her symptoms. Influenza caused a cessation of treatment and after that she was comfortable without treatment.

Case VII: A female patient, aged thirty-five, had paroxysmal rhinorrhœa on and off all the year, but worse in the spring. Her symptoms were definitely aggravated by flowers, dust or change of weather. Injections previously had conferred no benefit. The patient's nose was running when treatment was commenced. Three irradiations were given. She responded to treatment. She then contracted diphtheria and did not require further treatment.

Case VIII: A female patient, aged thirty-two, had hay fever in the spring for three years. She also had a chronic chest condition and double hyperplastic antritis. Endonasal irradiations were commenced late in the season, but controlled the rhinorrhœa for five days after each exposure.

Case IX: A female patient, aged twenty-five, had hay fever in the spring for years. Treatment was commenced late in the season, but gave relief for at least a week, and she states she will commence early next season.

Case X: A female patient, aged forty, had hay fever in the spring for many years. One irradiation late in the season gave relief for several days and she had to return to the country.

Group III: Failures.

Group III, that of the failures, comprises four cases.

Case XI: A male patient, aged thirty-four, had hay fever every spring as long as he can remember. He was sensitive to three grasses. Injections gave no result. He had trouble with his nose all the year round, but was worse in spring. Endonasal irradiations had no effect. On further investigation the tonsils were clinically septic with a retention cyst in one. A definite spur was present on the base of the septum blocking the right nasal floor. X ray examination of the sinuses revealed no abnormality.

Case XII: A female patient, aged thirty-eight, had chronic nose blocking and running for years all the year round, but worse in spring. She had almost a constant "cold." Endonasal irradiation gave relief for only twenty-four hours on each occasion. X ray examination revealed moderately gross mucosal thickening in the antra.

Case XIII: A female patient, aged thirty-five, had hay fever every spring and summer for many years, and her nose was always blocked in other seasons. She also had a typical upper half headache of the Sluder type. She had had all sorts of treatment and was decidedly neurasthenic. No result was obtained from endonasal irradiation.

Case XIV: A female patient, aged twenty-seven, had nose running and blocking during October, November and December, and was seen first on January 12, 1931. This patient had the most extreme allergic state of her nasal mucosa, the turbinates being very swollen and of a plum blue colour. No result was obtained from endonasal irradiation. X ray examination of the sinuses revealed no abnormality.

The best results were thus obtained in patients whose attacks were purely seasonal and who had no trouble during the other months of the year. All the cases of Group I are of this type. Among the four failures were three patients with continual trouble all the year round and one patient with other fifth nerve manifestations. Case XIV was the greatest surprise, and perhaps greater experience in dosage would obtain some result. Pathological change in the nose and throat definitely seemed to lessen the response.

Method.

I have used a water-cooled Kronmayer quartz lamp with Cemach's nasal glass wedge attached; the latter conducts the rays into the nasal cavity. The patient sits on a chair and a nasal speculum is inserted with the left hand. The lamp being held in the right hand, the nasal glass wedge is then quietly placed in the nose, the tip reaching the anterior end of the middle turbinate. Bumping the septum or middle turbinate causes great discomfort, and for this reason the person using the lamp should have some skill in intranasal manipulations. A stop-watch controlled by an attendant gives the desired exposure. In this series I have not found it necessary to use a local anæsthetic, but the insertion of the rod must be carefully done. The standard length of exposure is sixty seconds to each nasal chamber, increasing by periods of ten seconds up to two minutes. I have not used the blue filter as Cemach does.

It is not desired to advance the method in opposition to the accepted allergic treatment, but I believe that it is a very valuable alternative. In cases that respond well it is preferable because of its simplicity.

Acknowledgement.

I wish to thank Dr. C. Sutherland and Dr. Ivan Maxwell for their interest and suggestions during the season, for it was whilst I was working in the former's allergic clinic that I became interested in the subject.

DIAPHRAGMATIC HERNIA AND OTHER GASTRO-INTESTINAL LESIONS.

By F. N. Rodda, M.B., Ch.M. (Sydney),
Orange.

Mrs. H.J.K., aged seventy-two years, was referred to me by Dr. C. B. Howse, of Orange, for radiological investigation of the gastro-intestinal tract on April 13, 1931.

The patient, a small, slender old lady, has had nine children, most of them being very large, and the last one

particularly, weighing 5·6 kilograms (twelve and a half pounds) at birth. She herself attributes all her troubles to the size of this child, as her ill health all seems to date from this pregnancy. This was about 1900. During the pregnancy (at four and a half months) she had an attack of appendicitis. In 1910 she had pyelitis and cystitis which caused her much trouble for about three years, and ever since then she has had urinary symptoms suggestive of cystitis, though she has not been laid up with it. In 1914 she had another attack of appendicitis, but she refused operation and was in bed with a mass in the right iliac region for a month. She has had "indigestion"—chiefly gastric flatulence and discomfort after food—for about sixteen years, and she is practically always constipated.

About two months previous to X ray examination she started vomiting about midnight one night, though she felt in her usual health when she went to bed. The vomiting was followed at 4 a.m. by a fairly large hæmatemesis. No melæna followed this. At the time of my examination she was better again, but her "digestion" was poor. She complained that she could not take anything to eat just before she lay down, because, if she did, it "repeated" and she had severe pain across the epigastrium and the lower part of the thorax anteriorly. Also she has a feeling when she swallows as if the food has difficulty in getting down properly, though it always does so.

Dr. Howse states that the urine shows no abnormality, nor has it done so for years.

Radiological Findings.

There was no obstruction to the passage of the opaque meal through the œsophagus, but the following abnormalities were found in the gastro-intestinal tract, which was examined by means of the opaque meal as far as the splenic flexure.

1. Examination with the patient on her back in the horizontal position shows that the whole of the cardiac end of the stomach is in the thorax, having evidently passed through the œsophageal opening in the diaphragm. It is very markedly narrowed where it passes through this opening, so that the stomach is divided into two pouches—one above the diaphragm and the other below it.

2. Lying within the duodenal loop there is a large diverticulum or accessory pocket, which arises from the second or descending portion of the duodenum. This still contains a barium residue twenty-four hours after the taking of the meal.

3. There is another, smaller diverticulum connected by a vertical canal with the duodeno-jejunal junction, above which it lies.

4. There is a small diverticulum of the proximal transverse colon near the hepatic flexure.

5. Also a film of the renal areas reveals two large branched calculi in the right kidney, though these have not been verified by operation.

Comment.

Diaphragmatic hernia may be congenital or traumatic, but is more often the latter, as, for instance, from bullet wounds.

Carman, of the Mayo Clinic, states that in the traumatic form of diaphragmatic hernia a history of a crushing injury of the lower part of the thorax and upper part of the abdomen or a sudden doubling of the body with the knees against the chest can often be obtained. There is no history of that kind in this case, and it is an interesting question as to whether this is one of the rarer cases of congenital diaphragmatic hernia or whether the recurrent great increase in intraabdominal pressure in nine pregnancies with large children, culminating in one with a 5·6 kilogram baby, in a woman who is smaller and slighter than the average, has been too much for the fibres about the œsophageal opening of the diaphragm, which finally gave way. It may be noted that the patient states that all her ill-health seems to have dated from that last confinement.

The large pouch opening into the descending portion of the duodenum is very probably an accessory pocket, the result of a chronic perforated duodenal ulcer. The cause of the hæmatemesis two months before the examination is, therefore, interesting. Had it been due to an acute exacerbation of a duodenal ulcer in this situation one would certainly have expected it to be followed by melæna, as a large quantity of blood was poured into the lumen of the gastro-intestinal tract and vomited. It appears more likely that there was some sudden constriction of the stomach in the diaphragmatic hernial opening with resultant congestion of the veins in the thoracic portion of the stomach and rupture of one of them.

The presence of a diverticulum at the duodeno-jejunal junction is, I should think, uncommon, and the patient has still another small one in the proximal transverse colon.

The presence of two large branched calculi in the right kidney with no localizing symptoms, such as either severe or even slight chronic pain, is interesting.

Finally, it must be distinctly uncommon to find such a collection of abnormalities in one patient, and that patient, though seventy-two years of age, able to live a normal and active life, apart from the necessity for much care in her diet.

Acknowledgement.

I am indebted to Dr. C. B. Howse for permission to report this case and for the notes on the patient's past history and on the recent symptoms.

Reviews.

MATERIA MEDICA AND THERAPEUTICS.

Hale-White's "Text Book on Materia Medica and Therapeutics" is so well known to the student and practitioner that it requires no introduction. First published in 1892, it has now reached its twentieth edition.[1] Sir William Hale-White, however, has left the revision of the latest edition to Dr. A. H. Douthwaite. The arrangement of the book is in general excellent. The different parts deal with definitions, pharmacy, pharmacology and therapeutics, and then *materia medica*, the last mentioned being devoted to the individual drugs (inorganic, organic, vegetable and animal, including antitoxic sera and vaccines), also protein therapy and vitamins. In the appendices are Latin phrases used in prescriptions and alternative preparations sanctioned for use in tropical, subtropical and other parts of the British Empire. One excellent feature of the book is that it is not burdened with a multitude of superfluous drugs and preparations thrown upon the market by manufacturing firms. In fact, the book is too conservative in that regard. Many preparations which will most likely be in the 1931 British Pharmacopœia are not even mentioned. Amongst these may be mentioned trichloracetic acid, ethylene, anæsthesine, silver-arsenobenzene, dichloramine-T, ergotoxine ethane-sulphonate, fluorescein, soluble phenobarbitone, the tannate and ethyl-carbamate of quinine, antimony and sodium tartrate, theophylline (or theocine), thallium acetate and serum anti-Welchicum. Other omissions of preparations in use by the profession are "Spinocaine," "Percain," "Ouabain" and sodium thiosulphate. It seems a pity that with the publication of the new pharmacopœia, probably this year, this edition will be entirely obsolete. The new matter in the book includes ephedrine, quinidine, "Novasurol," mercurochrome, "Avertin," liver substance, gastric tissue (hog's stomach), lipiodol (iodine combined with a vegetable oil), sodium tetraiodophenol-phthalein, "Uroselectan" (but not the newer "Abrodil"), "Yohimbene" (as an aphrodisiac), measles convalescent serum (but not infantile paralysis serum), parathormone and vitamins. No mention is made

[1] "Materia Medica, Pharmacy, Pharmacology and Therapeutics," by W. Hale-White, K.B.E., M.D., LL.D.; Twentieth Edition, revised by A. H. Douthwaite, M.D., F.R.C.P.; 1931. London: J. and A. Churchill; Sydney: Angus and Robertson. Foolscap 8vo., pp. 720.

of the close chemical similarity of ephedrine to adrenalin nor of its local use in turbinal congestion. The possible dangers of quinidine and "Novasurol" are not indicated. It is correctly stated that there is no evidence of parathyreoid activity when given by mouth; but no reference whatever is made to the two different constituents of the posterior pituitary body. Only half a page is devoted to vitamins, and this is so incomplete and inadequate that it would have been better omitted. The grouping of drugs is not always happy. For instance, benzyl benzoate and "Atophan" are grouped with lysol, brilliant green and acriflavine as all similar to cresol, which has no justification pharmacologically. Again, another unhappy instance is the classing of sodium tetraiodophenol-phthalein with phenolphthalein and carbolic acid. The first named obviously should be with the iodine compounds lipiodol and "Uroselectan" which are all used for X ray examinations. Phenolphthalein should be with the purgatives. Kava is placed with the local anæsthetics, although it is not used as such. Its proper place is with cubebs and copaiba. Some misprints, especially in the index, make reference somewhat difficult, and surely "canula" should read "cannula." What precisely does the author mean by Australasian and again Australian Colonies? Should not vaselin now be spelled without a terminal "e"? This is a most excellent text book, but it has some blemishes which could be profitably removed from the next edition.

NEPHRITIS.

There are few better ways of presenting the natural history of a disease than by taking series of cases and following these for as long a period as possible until recovery takes place or death supervenes. If in the latter circumstances *post mortem* examinations and studies of the pathological anatomy can be made, a very complete picture is obtained.

Such is the course followed by Dr. D. Van Slyke and his group of fellow workers in studying nephritis—and their results are published in a slim, but tight packed volume of the "Medicine Monographs" series. The name of the great director of the group is in itself sufficient to insure the high quality of the work, but it is evident that he has chosen as his helpers men deserving of his selection.

The book begins with a discussion on nomenclature, and on the whole the authors follow Addis, though his classification is set down alongside that of Volhard and Fahr.

The much debated "nephrosis" is put into a separate class from the condition often loosely called "nephrosis," secondary to acute hæmorrhagic nephritis, which Addis calls "chronic active" and Fishberg "nephrotic type of chronic glomerulonephritis."

The authors' criterion for the differentiation between the two is the constant absence of hæmaturia in nephrosis. Moreover, the pure nephrosis never goes on to the "terminal" (Addis), azotæmic (Achard) or hypertensive (Fishberg) type. The whole conception of nephrosis as a separate entity has been criticized in America by Christian and in England by Gainsborough and Bennett, Dodds and Robertson. The sixty-six cases were studied for periods varying from a few months to thirteen years, and are divided as follows: Numbers 1 to 23, acute hæmorrhagic nephritis; 23A to 24, latent form of hæmorrhagic nephritis; 25 to 27, active chronic form of hæmorrhagic nephritis; 38 to 50, terminal stage of hæmorrhagic nephritis; 51 to 56, arteriosclerotic nephritis; 57 to 66, degenerative nephritis or nephrosis. (One at least which became uræmic, was a case of amyloid kidney.)

A chart is given of each patient showing the essential features of the disease as follows: Blood urea clearance, hæmaturia, hypertension, plasma protein deficit, gross proteinuria, œdema, anæmia.

These naturally require little comment, save the first. The authors give no other test for renal efficiency than this; an account of the test was given in The Medical Journal of Australia of July 4, 1931. Therefore, no further reference to it will be made, except to state that it requires the following determinations: (i) a blood urea, (ii) quantity of urine excreted in one hour, and (iii) urea content of specimen of urine.

Unfortunately no table of comparison with other tests is given, so that those who are accustomed to use Mosenthal's, Rowntree's or MacLean's tests are apt to be left rather uncertain of the exact values of the results given.

But otherwise, apart from the small size of the charts, which makes reading a little difficult, the work is admirable. Any physician faced with a case of nephritis can find among these charts at least one similar case; from charts and from the lucid and complete comments which accompany them, he can gain an insight into ætiology, course and prognosis which nothing else could give him. In eleven of the twenty-five fatal cases autopsies were held and the findings, gross and microscopical, are given at length, often with illustrations in half tone or colour.

The whole comprises a clinical record of remarkable completeness, useful alike to specialist or general practitioner, and an inspiration to any research worker. It is in every way worthy of the series in which it appears.

There is unfortunately no index, but there is a very full table of contents. Paper and printing are up to the standard of other volumes in the series. The binding is unfortunately of that bright blue cloth which is so intensely attractive to the domestic cockroach.

[1] "Observations on the Courses of Different Types of Bright's Disease and on the Resultant Changes in Renal Anatomy," by D. D. Van Slyke *et alii* ("Medicine Monographs." Volume XVIII); 1930. London, Baillière, Tindall and Cox. Royal 8vo., pp. 130, with illustrations. Price: 13s. 6d. net.

DIETETICS.

"Handbook of Diets" is a book of one hundred and eight pages, by the dietitian of the London Hospital, Rose M. Simmonds.[1] In the introduction the author defines her task as "not to teach nutrition . . . but to supply a collection of diets and food values . . . ."

It is a definite improvement on most books of its kind in that most of the diets are quantitative as well as qualitative. Nowadays dietetians are realizing the necessity for quantitative dietetic adjustment in an ever-increasing number of conditions. The time has passed when *diabetes mellitus* was the only condition thought to require such control.

The only important criticism that should be made concerning this book is that the diets set down in it do not cover a sufficient caloric range. In this book only one or two examples of quantitative diets are given for any particular condition, such, for instance, as *diabetes mellitus* or obesity.

One of the excellent features of this hand book is the careful selection of recipes and detailed description of their preparation.

There is nothing of importance omitted that is within the scope of a practical book of this kind. A notable achievement is the inclusion of detailed information concerning the inorganic content of foods, knowledge that is difficult to gather from even authoritative works on nutrition. Information concerning acid and alkali producing foods is also supplied which may be applied to the dietetic management of such conditions as nephritis *et cetera*.

Gout, typhoid fever, peptic ulcer, constipation, epilepsy, nephrosis and primary anæmia are but some of the complaints for which the appropriate dietary is described. Children's requirements are also included.

In conclusion it may be stated that this book would be an invaluable addition to the library of physician, surgeon or nurse, embodying as it does almost all the recent advances in the subject with which it deals.

[1] "Handbook of Diets," by R. M. Simmonds, S.R.N.; 1931. London: William Heinemann (Medical Books) Limited. Demy 8vo., pp. 115. Price: 7s. 6d. net.

ILLUSTRATIONS TO THE ARTICLE BY DR. HUGH C. TRUMBLE.

FIGURE V.
Skiagram of colon in Case I shortly before operation on April 30, 1928.

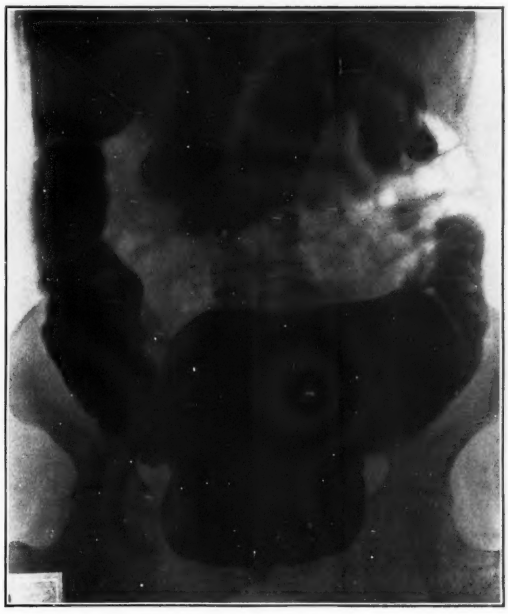

FIGURE VI.
Skiagram of colon in Case I in October, 1930, two and a half years after operation.

FIGURE VII.
Skiagram of colon in Case III just before operation.

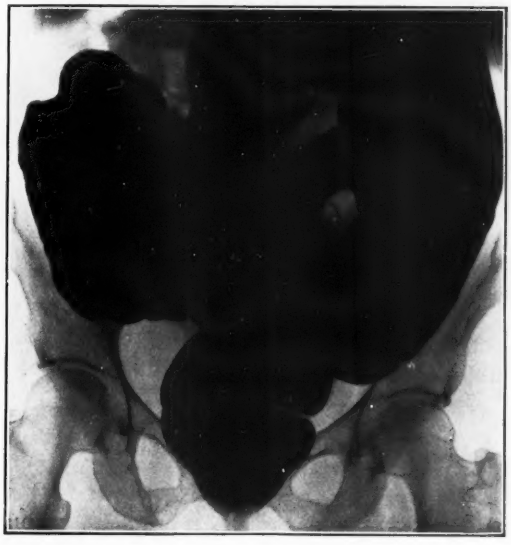

FIGURE VIII.
Skiagram of colon in Case III one month after operation.

ILLUSTRATIONS TO THE ARTICLE BY DR. LESLIE UTZ AND DR. LEILA KEATINGE.

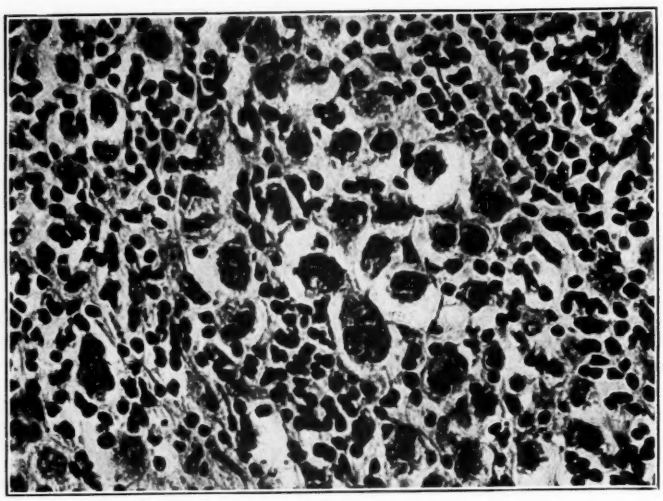

FIGURE I.

Section of lymph gland in early stage of Hodgkin's disease. There is a marked endothelial cell proliferation, an enormous number of eosinophiles, numerous mononuclear and multinuclear lymphadenoma cells. Some cells show karyokinetic figures. A few plasma cells can also be seen. × 400.

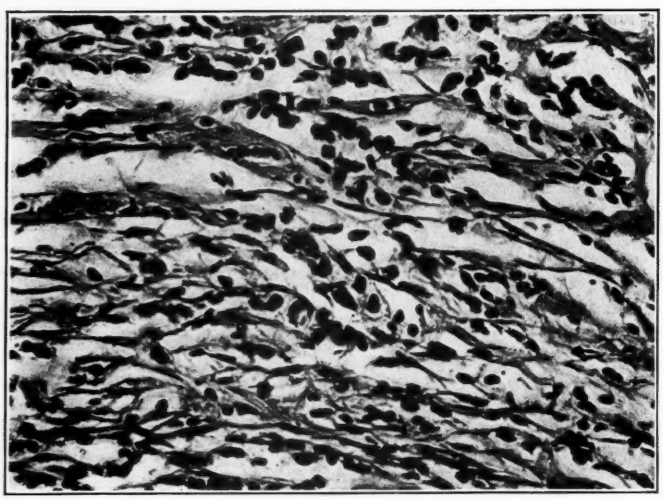

FIGURE II.

A photograph from the same section as Figure I. Here there is a fibrous area with some endothelial cell proliferation and a few lymphadenoma cells can be seen. It is significant that even in the same section fibrous tissue is abundant in some areas whilst the typical cellular areas are seen elsewhere. × 400.

The Medical Journal of Australia

SATURDAY, OCTOBER 3, 1931.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction, are invited to seek the advice of the Editor.

CANCER OF THE STOMACH.

When a prominent medical practitioner was asked not so long ago to write an article for this journal on a subject of which he was well qualified to speak, he hesitated, and to justify his hesitation said that all that was known about the subject had been said before, that it had been said by abler men than he, and that apparently no good had come from the constant repetition. When it was pointed out to him that, though his conclusions might be similar to those of others, his experience was unusual and his authority unquestionable, and when it was suggested to him that constant reiteration of the same facts, possibly from different points of view, was the only available means of teaching, he consented. A valuable contribution was the result. Arguments of this kind might be applied to cancer of the stomach, a subject about which it might appear that little new could be written. It is a condition that confronts surgeons, physicians and general practitioners. Of all forms of malignant disease it is perhaps the most difficult of diagnosis in its early stages.

Medical practitioners have all seen patients with advanced gastric carcinoma who have gone to their graves either because they sought advice when it was too late for surgical treatment, or because a wrong diagnosis was made when they sought advice on account of some irregular digestive trouble. It would naturally be thought that, knowing the inevitable result of delay as no one else can know it, and having the dangers so constantly brought before them, medical practitioners would at least pay some attention to the danger signals when they become manifest in their own bodies. But apparently when medical men become patients they differ very little from other people. This has been shown in a study by Dr. W. C. Alvarez, published in a recent number of *The Journal of the American Medical Association*. He analyses the histories of forty-one medical practitioners operated on at the Mayo Clinic during the last seven years. Twenty patients had symptoms of fairly short duration, with an average of about twelve months. Eight of these had symptoms of five months' duration or less. In twenty-one cases the question of ulcer obtruded itself in the diagnosis. Details are given by Dr. Alvarez of several cases in which the cancerous condition manifested itself as a bolt from the blue. The case histories are worthy of careful study by every medical practitioner. Further details cannot be given in this place. At the same time several important conclusions can be stated.

The first conclusion is that patients with gastric ulcer are not immune to carcinoma. Some observers state that ulcers do not undergo carcinomatous degeneration. This has yet to be proved. The fact remains that patients with symptoms of ulcer and with gastric lesions giving the typical appearances of ordinary benign ulcer may manifest a change of symptoms, either a change in type or an aggravation, and shortly after this change occurs an inoperable carcinoma may be found at operation. It would be very difficult to prove that the ulcer was carcinomatous. Dr. Alvarez states that those who look on gastric ulcers as innocuous and practically immune to carcinomatous degeneration are thinking of "the cases that are left in the gastric ulcer portfolio after all records of patients who died with a mistaken diagnosis are removed." We must agree with him.

The second conclusion has to do with the psychology of the medical practitioner. Medical

practitioners are not such fools as to suppose that the possession of a medical diploma confers on the gastric mucosa of the holder an immunity to cancer. The truth is that they have the same mentality as other folk, they have the same habits of procrastination and show the same refusal to face facts. It might be argued that their stomachs are their own, that their lives are their own, and that these may be neglected or disposed of as their owners think fit. Even if this were granted, gastric carcinoma would seldom be chosen as a method of disposal. If a medical practitioner's neglect of himself is due to a mistaken interpretation of symptoms, the outlook is not bright for his patients. If the neglect, on the other hand, is just a *laissez-faire* attitude, it would appear that there is little hope of "educating the public" to seek early treatment.

The third conclusion to be drawn from Dr. Alvarez's report is the most disturbing: The discovery of extensive cancer within a few weeks of the first appearance of symptoms shows the hopelessness of ever being able to make an early diagnosis in all cases of gastric cancer, "unless some day thorough periodic examinations are the rule for every one." This conclusion has, of course, been stated before. Dr. Alvarez writes:

> So long as most physicians are willing to treat epigastric pain in older persons expectantly and without consultation with expert roentgenologists, and so long as they are willing to treat gastric ulcer medically without fortnightly roentgenologic supervision there can be no hope of lessening the mortality from cancer of the stomach.

The suggestion that gastric ulcer treatment should be controlled by X ray examination every two weeks is worthy of consideration. It would be interesting to discover whether this has been done by physicians and radiologists in Australia. Until thorough periodic examination of every member of the community can be undertaken, the present teaching in regard to diagnosis and treatment must be emphasized and reemphasized.

Current Comment.

THE ELIMINATION OF UROBILINOGEN.

C. J. Watson has engaged in a special study of the average daily elimination of urobilinogen in health and disease, with particular application to pernicious anæmia.[1] He states that there are many quantitative methods of estimating urobilin. There is the gravimetric method of G. Hoppe-Seyler, and some have used the fluorescence of urobilin with zinc salts, or the urobilinogen aldehyde reaction. These have been used in colorimetric or dilution methods (the latter either of colour or absorption bands). The spectrophotometric method may be included in the latter. D. Charnas was the first to employ the aldehyde reaction quantitatively as well as the spectrophotometer, but his methods have been adversely criticized. Methods based on fluorescence alone are open to criticism. Fluorescence with zinc salts varies very greatly with the conditions existing in the solution, and, while these may be adjusted, no fluorescence method has been based on a crystalline substance except that of H. Opitz and K. Choremis, when H. Fischer's mesobilirubinogen was used. A. Adler drew attention to the wide range of strength of fluorescence of the urobilinogens of different authors, hemibilirubin or mesobilirubinogen having, after oxidation, a more intense fluorescence than any of the other substances. The lack of chemical individuality of urobilin and Fischer's idea that the commonly termed "urobilin" in the urine is probably urobilinogen in relationship with a fluorescent bile acid or cholesterol derivative render the usefulness of fluorescence doubtful, a doubt which will persist until there are more exact quantitative analyses of urobilin-containing urine as to urobilinogen, bile acids and cholesterol.

Methods depending on dilution of absorption bands have been used, but dilution values for absorption bands of fluorescence are subject to the personal equation. Since indole and skatole produce the same colour and absorption band as does urobilinogen-aldehyde compound, they must be removed. In 1925 A. J. L. Terwen described a method whereby both preformed and oxidized urobilinogen are estimated as one and skatole and indole eliminated. Here also the question of the chemical identity of urobilin arises. On exposure to light and air urobilinogen becomes darker and increasingly fluorescent, and in such exposed solution the urobilin absorption band appears. Terwen showed that the Ehrlich reaction increased and that the urobilin band diminished or disappeared with reduction of the type employed in his method. In 1927 A. Adler reported an apparatus for the quantitative extraction of mesobilirubinogen, and in 1928 clinical results with this method were reported by Adler and M. Bressel. Adler's method estimates only the preformed urobilinogen, while Terwen's was standardized on a non-crystalline urobilin. Terwen's method is applicable both to urine and fæces and is considered better for clinical application. Watson describes the method he uses, which is a modification of Terwen's, standardized with crystalline hemibilirubin or mesobilirubinogen (urobilinogen). Standardization of the colorimetric procedure is based on the colour produced by a chemical entity (mesobilirubinogen) when condensed with para-

[1] *Archives of Internal Medicine*, May, 1931.

dimethyl-aminobenzaldehyde by means of hydrochloric acid. This process yields slightly higher values than Terwen's original procedure.

Employing this method, Watson made observations in a series of normal and abnormal persons. He considers that for males 250 milligrammes of urobilinogen and for females 175 milligrammes is the upper limit of normal for the fæces. He noted no definite relationship between body weight and urobilinogen elimination. F. Mueller (1892) first observed the definite increase of urobilinogen in the fæces after release of an obstructive jaundice (catarrhal or other). C. B. Wallace and J. S. Diamond (1925) considered that urobilinuria occurred with jaundice due to hepatic disease, not with that due to simple extrahepatic obstruction. R. Elman and P. D. McMaster found urobilinuria soon after experimental obstruction of the common duct. Further investigation is required to estimate the value of urobilinuria in differentiating hepatic and extrahepatic obstructive jaundice. Catarrhal jaundice occasions marked urobilinuria when it is clearing up.

Repeated estimations of urobilinogen in pernicious anæmia treated by liver suggested that two groups might be made in which the absence or persistence of urobilinuria after the reticulocyte crisis was correlated with the rate of increase of erythrocytes and hæmoglobin. Those patients from whom urobilinuria disappeared at or before the reticulocyte crisis displayed an increase of hæmoglobin at the average rate of 0·143 gramme a day and of 0·055 million of erythrocytes a day; for those in whom urobilinuria persisted even for a brief time after the reticulocyte crisis, the values were 0·120 and 0·048. In these groups the average elevation of hæmoglobin attained in the first (with disappearance of urobilinuria) was 14·2 grammes and of red cells 3·99 millions. This was noted after an average period of 47·7 days. In the second group the corresponding values were 10·7 and 3·56 over an average period of 42 days. The small variation in time does not account for the discrepancy, at all events as regards the hæmoglobin, where correction for the 5·7 days would bring the value only to 11·4, while the corrected red cell average would be 3·83. In the second group some interference with hæmoglobin formation is suggested, but insufficient data are available to warrant definite conclusions. In relapse the average urobilin value in the stool was 557·7 grammes, and in remission produced by liver treatment 183·6. This suggests that liver acts by checking increased blood destruction.

Nothing is known of the factor of urobilin resorption in pernicious anæmia; perhaps it is reduced in relation to the usual gastro-intestinal lesions. Against this idea is the fact that there may be considerable urobilinuria. No relation was found between the amounts of urobilinogen in the urine and fæces. The urobilinogen in the urine may be increased coincidentally with a low amount in the fæces and *vice versa*. The simple "overflow" theory thus receives no support. It is suggested that, on account of the recognized relation of liver injury to urobilinuria and the anatomical variations in the liver during remission or relapse of pernicious anæmia, urobilinuria in such disease is merely evidence of hepatic derangement. Watson concludes that estimations of the average daily elimination of urobilinogen may give useful information in conditions of jaundice and anæmia. Terwen considered that the average urobilinogen of the normal stool was 134 milligrammes a day. Watson's series showed 151·2 milligrammes. For pernicious anæmia (relapse) the figures are respectively 455·3 and 554·7. Urobilinogen values in the stools were diminished in secondary anæmia, unless a regenerative phase was present with increased blood destruction, when they were higher. Fæcal urobilinogen was increased for a brief period after release of obstructive jaundice and, with injury to the liver, the fæces-urine ratio was reduced. In pernicious anæmia the rate of increase of hæmoglobin and red cells in patients on liver treatment was rather slower if urobilinuria lasted beyond the reticulocyte crisis. It was considered that urobilinuria was not merely due to overflow with a normal liver, but probably to actual liver disorder more pronounced in some cases than others.

These observations are valuable and suggestive, and taken in conjunction with the investigations of M. H. Edelman and his fellow workers on urobilinuria in cardiac disorders (reported in these columns on July 12, 1930) may prove of the greatest practical utility.

ACUTE APPENDICITIS IN OLD AGE.

An interesting study of appendicitis in old age has been made by J. Lewin.[1] He bases his conclusions on twelve cases. The ages of his patients ranged from 62 to 86 years. He states that the underlying factor in the clinical picture of appendicitis in old age is the alteration in the reaction of the tissues. This alteration is characterized by a tendency to chronicity following on a lengthened period of development. It is seen in both the reaction to infection and in the delay of healing processes. Lewin found that between five and six days elapsed before the patient sought surgical aid. There was less constitutional disturbance than is generally noted, and the amount of pyrexia was small. In most cases the signs and symptoms were those of acute and subacute intestinal obstruction rather than of an acute inflammatory lesion. Left-sided pain and tenderness were sometimes pronounced. Lewin suggests that acute appendicitis should be considered as a possibility in all acute or subacute intestinal obstruction in old people. He also thinks that the distribution of pain and tenderness should not be allowed to influence the diagnosis too much. At the same time pyrexia, though comparatively small, is definitely in favour of an inflammatory lesion as opposed to a purely obstructive one.

[1] *The British Journal of Surgery*, July, 1931.

Abstracts from Current Medical Literature.

MORBID ANATOMY.

The Lymphatic System of the Thyreoid.

S. D. GORDON (*The Canadian Medical Association Journal*, July, 1931) has investigated the lymphatic system of the thyreoid gland. He points out that Williamson and Pearse have suggested that the lymphatics of the thyreoid are arranged in two distinct systems, one draining the capsular region into the cervical lymph glands and the other draining the secreting portion of the organ and passing to the thymus. The author made a series of observations after injecting the thyreoids of dogs with India ink. He finds that the capsular and intraglandular lymphatics of the thyreoid communicate freely with one another and that the capsular system drains into the superior, inferior and pretracheal lymph glands. He can find no evidence of a second closed system draining into the thymus.

Malignant Phæochromocytoma of the Adrenals.

E. S. J. KING (*The Journal of Pathology and Bacteriology*, July, 1931) describes a case of malignant phæochromocytoma of the adrenals. Phæochromocytoma is the name applied to chromaffine tumours arising from the adrenal medulla. The author thinks that the rarity of chromaffine tumours is partly due to the lack of recognition until recent years of their special characteristics. In the author's case the growths were solid and bilateral. The only cells present were the completely differentiated phæochrome cells and undifferentiated cells possessing less protoplasm which did not take the chrome stain. No ganglion cells or other sympathetic nerve cells were present. Although the presumably anaplastic cells differed from phæochromoblasts, as observed in a developing embryo, in shape and density of staining, it was considered that these corresponded to primitive cells of the phæochrome series. Multiple metastases were present in the liver, lungs, bowel, bones, skin and aortic glands. The structure of most of these was the same as the anaplastic areas of the adrenals, but some showed both this and typical phæochrome tissue.

Primary Malignant Tumours of the Ureter.

M. J. RENNER (*Surgery, Gynecology and Obstetrics*, April, 1931) describes primary malignant tumours of the ureter. The morbid anatomist is quite familiar with malignant growths which secondarily involve the ureters. They are especially common in advanced carcinoma of the uterus. Occasionally also in the presence of a primary carcinoma of the abdominal viscera the ureter is compressed from outside by carcinosis of the peritoneum or by metastatic involvement of the abdominal lymphatic glands, or perhaps the ureter may even become infiltrated. However, it is a well known fact that the wall of the ureter will resist involvement by the tumour for a considerable time. A carcino-sarcoma of the right ureter is described by the author. The tumour arose from approximately the middle of the posterior wall of the ureter. It filled practically the whole ureter as a sausage-shaped formation, about the thickness of a finger. It penetrated into the urinary bladder and ended in a round swelling about the size of an apple. The tumour is regarded as a carcino-sarcoma and local predisposition of the tissue already present in the early embryonic stage is assumed to have existed, thus causing the subsequent formation of the growth. Of other malignant ureteral growths, about fifty carcinomata and about ten tumours of the mesenchyme, most of them malignant growths, have, up to the present time, been described. The opinion expressed by Israel, Glas, and Player, that carcinomata of the discharging urinary passages can produce metastasis of the type of benign papillomata cannot be accepted in view of the work by Stoerk. Stoerk found malignant tumours of the ureter in 0·029% of the *post mortem* material at the Pathological Institute of the University of Vienna. In the total number of observed cases of carcinoma, those of the ureter represent 0·14%; in the total of malignant tumours, 0·18%.

Tissue Resistance.

IN 1930 J. S. Young showed that hyperplasia of the epithelium lining the marginal alveoli of the lung of the rabbit can be produced by a single intrapleural injection of a solution of an electrolyte. He has continued his investigations (*The Journal of Pathology and Bacteriology*, May, 1931) and finds that a second injection of the same solution within fifteen or twenty days of the first fails to produce a further reaction, but that when the interval is longer it becomes effective again. The author concludes that the first injection has a twofold action on the cells; in addition to causing hyperplasia, it alters the physical state of the cells, so that they are temporarily indifferent to the second injection. The physical changes in the cells outlive the period during which increased cellular activity can be observed. In previous work the author expressed the view that cell division is determined by a precipitation of the colloids of the cell membrane. His present observations suggest to him that the inhibition of the epithelial reaction may be due to an alteration in the behaviour of the colloids of the cells. These results are complementary. They are consistent with the general conclusion that a precipitation of the colloids of the cell membrane is an essential phase in the sequence of biological changes which culminate in cell division. This phase precedes the earliest of those changes which can be recognized microscopically, namely, swelling of the cells.

The Effect of Fat-Free Diets on the Kidneys of Rats.

V. G. BORLAND AND C. M. JACKSON (*Archives of Pathology*, May, 1931) have investigated the effect produced by a fat-free diet on the kidneys of rats. The diet was practically fat-free, but otherwise normal. In rats reared on this diet the most striking and characteristic lesion was calcification in the cells of the renal tubules and in necrotic areas of the renal medulla. In extreme cases there was complete disintegration of the apical region of the pyramid. Various forms of renal epithelial degeneration also occurred to a variable extent; these may or may not be associated with the calcification. In the medulla large quantities of fatty or albuminous material sometimes accumulated, forming casts in the lumina of the tubules, and especially in the papillary ducts. An apical hyperplasia was often found in the renal pelvic epithelium; this usually appeared most pronounced when necrosis of the papilla was also present. The addition of from 2% to 20% of lard or of small amounts of cod liver oil usually prevented or cured the renal disorder, at least to a large extent. Other types of fat were not so effective. The concentration of protein in the diet, within the range used, showed no definite relation to the incidence or the severity of the renal lesions.

MORPHOLOGY.

A Tenuissimus Muscle in a Human Adult.

H. L. H. GREEN (*Journal of Anatomy*, January, 1931) records the occurrence of a persistent tenuissimus muscle in a human adult. The nerve supply arose from the common peroneal nerve in common with the nerve supplying the short head of the *biceps femoris*.

Experimental Studies on the Innervation of Striated Muscle.

HERBERT J. WILKINSON (*Journal of Comparative Neurology*, October, 1930) gives an account of the innervation of the *musculus obliquus superior oculi* of a cat. The left trochlear nerve was cut in twenty-two cats and various times, ranging from three days to fifty-five days, were left for degeneration. The superior oblique muscles and trochlear nerves of both sides were afterwards stained according to the Bielschowsky technique and all material was cut and mounted in complete serial order. Under a dissecting binocular microscope dissections were also made of the orbital contents of both sides of six cats.

The following were established. The little sensory endings occurring in eye muscle, which Boeke described as sympathetic or parasympathetic in origin, are identified as terminations in the arborization of proprioceptive sensory fibres. The trochlear nerve sometimes forms anastomoses with the trigeminal, but the trigeminal fibres which enter the trochlear, usually leave it again and do not enter the superior oblique. In a few cases one and sometimes two of these fibres enter the muscle and are found to be proprioceptive fibres. Most of the proprioceptive fibres in the superior oblique reach it *viâ* the trochlear. No ganglion cells were found in the course of the trochlear nerve. Data are given concerning the time required for complete disintegration of both motor and sensory endings. It is found that while motor endings usually disappear within about three days, they can occasionally be found five days after section of their axons. The sensory fibres quite commonly resist degeneration for over five days. This new evidence is discussed with regard to its bearing on the problem of the sympathetic innervation of striated muscle, and it is claimed that as a result of this investigation this hypothesis, as far as histological evidence is concerned, is untenable.

The Quantitative Distribution of the Pyramidal Tract in the Dog.

Arthur Lassek, Leslie Dowd and Arthur Weil (*Journal of Comparative Neurology*, October 15, 1930) demonstrate that the relative distribution of pyramidal tract fibres to the different segments of the spinal cord is approximately the same in the dog as in man. About 55% of all fibres innervate the cervical segments, 20% the thoracic, and 25% the lumbar and sacral segments. The cervical segments supply about 40% of the total musculature, 25% are innervated by the thoracic segments, and 35% by the lumbar and sacral segments. In the dog, as in man, the upper four cervical segments receive about five times more pyramidal tract fibres per unit of musculature than does the rest of the spinal cord. The number of pyramidal tract fibres which supply the different groups of spinal cord segments was estimated, and from this gross number was computed the amount for one grain of muscle. The figures are the same in man as in dog (one hundred fibres for the first to the fourth cervical and twenty-four for the fifth cervical to the second thoracic segment). The discrepancy for the thoracic segments (sixty-two and twenty-one respectively) may be explained by the relatively smaller amount of musculature which is supplied by these segments in man.

The Parathyreoid Glands.

R. J. Millzner (*Anatomical Record*, February, 1931) states that the parathyreoid glands are found on the anterior or lateral capsule of the thyreoid gland in approximately 30% of cases and on the true anterior capsule in approximately 10%. These variations in position affect the inferior parathyreoid more often than the superior in about the ratio of two to one. There is a definite relationship between the variations in parathyreoid position and atypical arrangements of the thyreoid vessels. The occurrence of parathyreoids on the anterior and lateral capsule of the thyreoid gland represents a constant normal variation in position and is uninfluenced by such factors as the size of the thyreoid gland or the type of disease present in a goitrous gland.

The Thyreoid Follicle.

J. L. Jackson (*Anatomical Record*, February, 1931) has examined forty-four human thyreoid glands recovered at autopsy. The average length of a normal follicle was about 164 μ, of a follicle in Graves's disease 169 μ, and of a follicle in colloid goitre 245 μ. The author shows that there existed in the glands examined a significant association between the size and shape of the thyreoid follicle and the clinical group to which it belonged, also between the age of the patient and the shape of the follicle.

Mammalian Lymphoid Tissue.

J. M. Yoffey (*Journal of Anatomy*, April, 1931) states that it appears probable that cells from mammalian lymphoid tissue travel *viâ* the blood stream to the bone marrow.

The Conducting System of the Monotreme Heart.

F. Davies (*Journal of Anatomy*, April, 1931) describes the conducting system of the hearts of platypus and echidna. The limitation of sino-auricular nodal tissue to the region of the right sinus valve in the presence of the intersepto-valvular space of the right auricle is evidence that the disappearance of the intersepto-valvular space in the higher mammalian heart is not the prime factor in the "condensation" of the sino-auricular ring of the lower vertebrate (piscine and reptilian) heart. The position of the sino-auricular and auriculo-ventricular nodes in relation to the sinus valves is discussed. The branch arrangement of the right limb of the auriculo-ventricular bundle in the montreme heart is described and compared with that of the right limb of the bundle in the bird's heart and with the present conception of the right limb of the bundle in the heart of the placental mammal.

Glomeruli in the Normal Human Kidney.

R. A. Moore (*Anatomical Record*, January, 1931) gives an account of an investigation into the total number of glomeruli in the human kidney based upon counts made on macerated injected aliquot samples. They find that the normal kidney of man from birth to forty years of age contains 800,000 to 1,000,000 glomeruli, with occasional values as low as 600,000 and as high as 1,200,000. There is no proof that post-natal nephrogenesis occurs in man. There is a senile loss of glomeruli in man, analogous to that which occurs in the rat. The total number of glomeruli in the seventh decade equals two-thirds to one-half of the adult count. The two kidneys of one individual contain about an equal number of glomeruli.

Histological Features of the Cranial Nerve.

H. A. Skinner (*Archives of Neurology and Psychiatry*, February, 1931) states that from the brain there is an outgrowth of glial cells along the cranial nerve trunks. The amount of glial outgrowth varies in the different nerves, but is more extensive in the sensory nerve trunk. The glial extension ends in a dome which is convex peripherally. The cells of the glial portion of the nerve trunk are astrocytes and oligodendroglia. No microglia was observed.

Pain Pathways in the Sympathetic Nervous System.

W. J. Mixter and J. C. White (*Archives of Neurology and Psychiatry*, May, 1931) relate their experiences with patients suffering from the severest types of pain, who were relieved by interruption of the dorsal sympathetic roots. The evidence obtained, together with that gained from diagnostic block with "Procaine" hydrochloride and injection of alcohol, has led them to believe that there may be definite sensory pathways running in the dorsal sympathetic chain.

The Inferior Dental Nerve.

C. Starkie and D. Stewart (*Journal of Anatomy*, April, 1931) observe that there are two definite plexuses in the course of the inferior dental nerve: (i) a postero-internal alveolar plexus and (ii) an antero-external plexus. The molars and bicuspids receive their nerve supply from the alveolar plexus, the incisors from the incisor plexus and the canines from either of them. The inferior dental nerves do not always extend across the symphysis. If such an overlap is present, it seldom extends beyond the central and never beyond the lateral incisor teeth of the other side.

The Prenatal Growth of the Cat.

H. B. Latimer and J. M. Aikman (*Anatomical Record*, January, 1931) give the first of a series of papers on an investigation into the prenatal growth of the cat. The body length increases much more rapidly during the early fœtal period than the body weight. When the weights of each of the four parts of the body are plotted against body weight, the resulting errors show that there is a difference in the growth rates. The authors base their results on a series of 264 specimens and supply numerous tables and graphs *et cetera*.

Special Articles on Aids to Diagnosis.

(Contributed by Request.)

III.

THE FRACTIONAL METHOD OF GASTRIC ANALYSIS AND ITS INTERPRETATION.

THE fractional method of gastric analysis, when the results are properly interpreted, gives much more information concerning the function of the stomach, in most cases, than the mere concentration of hydrochloric acid ("acidity") of the gastric contents. Much of the information obtained by X ray examination can be obtained by this method, and in places where X ray methods are not readily obtainable, the method can be of the greatest value.

The following should be noted in all cases: The volume and acidity of the fasting contents; the concentration of free and total acid in each of the samples removed from the stomach at quarter-hour intervals after administration of the test meal, and the shape of the curve obtained by plotting these values; the total volume which can be withdrawn from the stomach at two hours or, if the stomach is empty before this, the time of emptying; the dilution by gastric juices of the food in the samples withdrawn; and the presence or otherwise of mucus, bile, blood, pus *et cetera*, the microscope being used when necessary.

Method.

The apparatus required is very simple. It consists of: (i) a Rehfuss or Einhorn tube, thirty to thirty-six inches long, with a mark on the tube twenty-two inches from the metal bulb, (ii) a twenty or thirty cubic centimetre "Record" syringe, which just fits the free end of the gastric tube, (iii) a rack of nine test tubes, (iv) a measuring cylinder, (v) some small beakers, (vi) a one cubic centimetre pipette with rubber teat, (vii), two drop-bottles, containing Topfer's solution (dimethylamido-azobenzol) and phenol-phthalein solution respectively, (viii) a fifty cubic centimetre burette, (ix) a well-stoppered bottle of one-tenth normal sodium hydroxide solution.

The patient, after having fasted for twelve hours, is directed to swallow the tube (sitting up in bed or propped in an easy chair). He should be instructed to drop the bulb to the back of the tongue and then to swallow; thereafter occasional swallowing movements are made, but should be interspersed with deep breaths through the nose, with a view to obviating the retching sensation. When the bulb has passed the cricoid level, its downward progress becomes easy and is largely involuntary, and it is only necessary to "pay out" the tube gradually until the 22-inch mark is at the level of the teeth. The syringe is attached to the tube, and with gentle suction the whole of the fasting juice is removed and measured. With the tube in position the patient then drinks four hundred cubic centimetres of gruel prepared in the following way (which is simpler than that usually described). Two or three teaspoonfuls of Parson's (or Robinson's) groats are made into a thin paste with cold water and slowly stirred into 300 or 400 cubic centimetres of boiling water. The use of groats obviates the messiness of straining thin porridge through muslin. Salt can be added to taste, unless chloride estimations are to be made. The volume is finally made up to 400 cubic centimetres. The patient should be encouraged to read or knit throughout the period of the test. At quarter-hour intervals, up to two hours, or until the stomach is empty, whichever happens first, ten cubic centimetre specimens are withdrawn by the "Record" syringe, after, however, the piston has been drawn to and fro some six or eight times to mix the gastric contents thoroughly. This mixing before a sample is taken is important. After noting the presence or absence of mucus, bile, blood *et cetera*, or examining the fasting contents under the microscope when deemed necessary, the free and total acidity are determined and the results plotted to form a curve. For this purpose samples are centrifuged or allowed to stand until there is sufficient clear fluid above the gruel to draw off one cubic centimetre samples, by means of the teat pipette, into a series of beakers. To each is added five to ten cubic centimetres of water and two drops each of Topfer's reagent and phenol-phthalein. The contents of each beaker are now titrated with one-hundredth normal sodium hydroxide (freshly made up from the one-tenth normal solution) until the red colour produced by the free acid (when present) changes to yellow; and the amount of hydroxide used is noted. Titration is then continued until the colour once more changes to pink, and the amount of hydroxide is again noted. These two amounts multiplied by ten give the free and total acidity respectively.

The time of disappearance of starch in the later specimens is determined by the addition of a few drops of iodine solution. This indicates the rate of evacuation of the meal.

Interpretation of Results.

Interpretation can probably be best understood by a consideration of the various factors concerned in the production of the so-called "normal" test meal chart (Figure I).

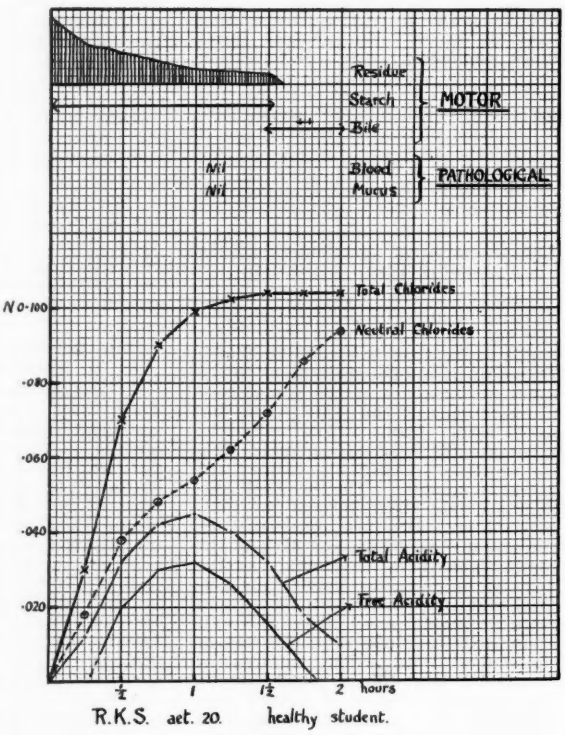

FIGURE I.

1. The Residue "Curve." When all of the ten cubic centimetre samples have been centrifuged or allowed to settle, it is usually found that the proportion of settled gruel residue diminishes in each succeeding sample. This can be conveniently represented by a falling curve. A rapidly falling curve indicates either rapid evacuation of food, or its increased dilution. The latter may be caused by swallowed saliva (which the patient should be asked to prevent), and by increased secretion of gastric juices, or regurgitation of duodenal and pancreatic juices, sometimes indicated by the presence of bile. Conversely, a diminished dilution indicates either delayed emptying, diminished gastric secreton (gastritis, carcinoma) or a diminished rergurgitation (over-rapid emptying, pyloric obstruction, or such weakness of the intestinal muscle that the regurgitative mechanism fails). Further differen-

tiation is afforded by the shape of the acidity curve, the iodine test, the presence of bile *et cetera*.

2. The Acidity Curve. The acidity or concentration of acid at any given moment in the mixed gastric contents is the resultant of a number of factors. Acidity may be raised by increased acid secretion, by increased rate of emptying (leaving a smaller volume of food to be acidified, and hence a higher concentration of acid) and by diminished regurgitation of duodenal fluids which dilute and to some extent neutralize gastric acid. Conversely, the acidity is lowered by any of the opposite conditions. In the normal curve the rise during the first hour or so is due entirely to the first two of these factors, namely, secretion and emptying. In the second hour the curve usually falls owing to dilution with neutral gastric and duodenal fluids. Obviously interference with any of the above factors will produce alterations in the shape of the curve, and these alterations give us the clue to the altered conditions which may be present in the gastro-duodenal apparatus, whether muscular or chemical.

Let us now consider some of these alterations and their effects.

(*a*) When duodenal regurgitation is diminished or absent, the falling curve usually seen during the second hour is converted into a steadily rising curve. This may result from pyloric stenosis, organic or reflex, or from general atonicity of the stomach, with delayed evacuation and a slowly rising curve (Curve C in Figure II); from rapid emptying in the irritable, hypertonic alimentary tract of many neuroses and of duodenal ulcer, with a rapidly rising curve (Curve B in Figure II); or from disease of the pancreas or its ducts, which may be suspected when there is a rising curve in spite of the presence of bile in the gastric contents.

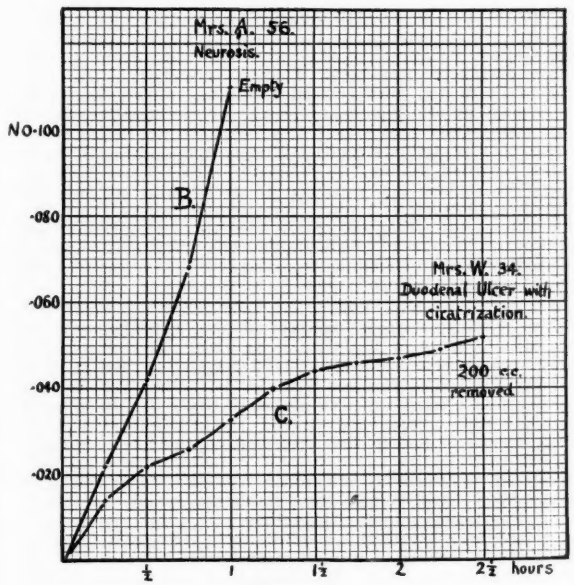

FIGURE II.

(*b*) When acid secretion is absent from the stomach, the tendency in an alimentary tract with normal muscular efficiency is towards rapid evacuation, owing to the failure of the "acid control" of the pyloric sphincter. A very rapid evacuation indicates a hyperirritability, usually of the whole tract, generally due to a neurosis, often resulting in gastrogenic diarrhœa. When with achlorhydria evacuation is unduly prolonged, there is a general slackness of gastric musculature, due either to general debility or to a chronic gastritis with or without carcinoma. In the latter condition the "residue curve" will be high, and thick mucus will often be present.

3. The total chloride curve is occasionally of value, but I have now discarded it, except in special cases. If we propose to estimate total chlorides, however, it is obvious that the gruel meal must be salt-free. Usually the chloride curve rises steadily to between 70 and 110 (0·07 to 0·11 N), even in many cases of achlorhydria. In, however, the achlorhydria of carcinoma, pernicious anæmia, gastrogenic diarrhœa and a few normal people the total chlorides seldom rise above 20 to 60.

4. Alterations in the emptying time are shown with great accuracy by this method and coincide in a large series of my cases with the emptying time as shown by X rays, except in certain cases of carcinoma of the stomach. The latter sometimes rapidly evacuates a gruel meal, but may show delay with the heavier barium meal used in radiography. Most healthy stomachs become empty at about two hours. Even marked delay in emptying need not necessarily be caused by organic obstruction of the pylorus. I have in two cases recovered four hundred cubic centimetres and two hundred and eighty cubic centimetres respectively two hours after the administration of the four hundred cubic centimetre meal. In both cases X ray examination revealed atonic stomachs, with no organic obstruction and a slowly rising acidity curve. Delayed evacuation with high acidity suggests a cicatrized peptic ulcer, while delay with very low or absent acid favours carcinoma of the pyloric region. Further diagnosis will be aided by the other findings. Stomachs that empty with great rapidity have a lively, often hypertonic, musculature. If acid is present, it rises rapidly, as in Curve B, Figure II, and almost always indicates a neurosis. Commonly a rapidly emptying stomach is associated with achlorhydria and gastrogenic diarrhœa.

5. The fasting contents usually varies from 20 to 60 cubic centimetres. If this volume is much increased, especially if the free acid present is more than 30 or 40, ulcer or pylorospasm is suspected.

6. Small spots or streaks of blood in one or two of the samples are generally of no significance, being caused by minute injuries caused by the stomach tube. There is therefore nothing to be gained by doing special tests for blood in gastric contents. Larger amounts of blood, however, especially if present in the fasting contents and in most or all of the samples of test meal, are strongly suggestive or almost diagnostic of ulcer or carcinoma.

Swallowed mucus floats in lumps and is of no importance, but when intimately mixed with the gastric fluids so as to be inseparable from them, the mucus has been derived from an inflamed stomach wall. Lactic acid, which in moderate concentration may be mistaken for free hydrochloric acid when titration is carried out in the usual way, is the rule in carcinoma of the stomach and should invariably be tested for when this condition is suspected.

Some Examples.

When all the information obtained by the fractional method in any case has been put together, one can usually obtain a very accurate estimation of the muscular and chemical function of the stomach, and some idea of the function of the intestine as well. A routine examination by this method is not, of course, necessary in all cases to obtain this information.

Owing to lack of space I do not propose to add anything to what has already been said about the changes found in such conditions as chronic gastritis, carcinoma and pernicious anæmia, since these are so well known. But a few words about the less known findings in some other conditions may be of value, especially where the results have a direct bearing on treatment.

1. *Diarrhœa.*—All cases of long-standing diarrhœa, for which there is no obvious cause, in otherwise healthy people with good appetites should be examined by the fractional method. As a rule achlorhydria is found. The dramatic results which follow the use of dilute hydrochloric acid in four cubic centimetre (one fluid drachm) doses can be appreciated only by those who have seen them. Three such cases of seven, fifteen and twenty-two years' standing respectively, which had resisted all other treatment, cleared up in from one to six weeks after acid was administered.

2. *Asthma.*—Asthma patients often exhibit achlorhydria and are often relieved, sometimes completely, by the use of acid.

3. *Colospasm.*—Colospasm, often so difficult to diagnose, is in most cases accompanied by gastric symptoms of very diverse types. Achlorhydria is more common in this condition than is generally supposed, with the result that undigested and irritating gastric contents enter the intestine, adding to the troubles of that organ. The use of hydrochloric acid is most effective in these cases, when other treatment is so disappointing. When hyperchlorhydria is present, the use of alkalis leads to ease of many of the symptoms.

4. *Peptic Ulcer.*—There is nothing in the test meal chart which one can regard as characteristic of uncomplicated gastric ulcer, all variations in acidity, the shape of the curve and emptying time being found. In duodenal ulcer, however, one generally finds an acidity curve rapidly rising to 60 or 70 followed by a sustained high plateau. The fasting contents are also increased in volume and acidity. When, however, cicatrization leads to pyloric obstruction, there is an increase in fasting contents, and the acid curve of the meal slowly rises to a maximum at two hours, when a volume of 100 and 300 cubic centimetres may be withdrawn.

5. *Reflex Dyspepsias.*—Reflex dyspepsias have already been dealt with above.

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British Medical Association News.

SCIENTIFIC.

A MEETING OF THE OPHTHALMOLOGICAL SECTION OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held on May 13, 1931, at the Victorian Eye and Ear Hospital, DR. J. A. O'BRIEN in the chair.

Trachoma and Ophthalmia in Egypt, 1915 to 1918.

SIR JAMES BARRETT read a paper on trachoma and ophthalmia in Egypt in 1915 to 1918 and based his statement on three reports and on personal experience. The three papers were: (i) A report by Lieutenant-Colonel Eason on ophthalmic work in Egypt, 1915 to 1916, *British Journal of Ophthalmology*, August, 1917; (ii) a report by Sir James Barrett on the ophthalmic work in Egypt to November, 1925, (*a*) *British Journal of Ophthalmology*, (*b*) "Vision of the Possible," (*c*) "A.A.M.C. in Egypt"; (iii) "Ophthalmic Practice in the Mediterranean and Egyptian Expeditionary Forces, 1915 to 1918," by Lieutenant-Colonel Eason, *Guy's Hospital Reports*, Volume LXX. He said that those who would trouble to look through these reports would realize the change which had taken place in the minds of specialist medical officers as a result of experience respecting the visual acuity requisite for the discharge of various military duties. For example, vision which had proved sufficient for the discharge of certain duties was now regarded in Australia as qualifying for admission into an institution for the blind, and the standard of vision which disqualified an immigrant was higher than that required for a soldier in the fighting lines in Palestine. However, as his remarks would deal with ophthalmia and trachoma, no further reference need be made.

His report extended over the period January to November, 1915, when he was invalided to Great Britain, returning to Egypt in March, 1916. Lieutenant-Colonel Eason had become Consulting Oculist in Egypt and his reports covered the ground from November, 1915, to the end of the war. During the first period, half the ophthalmic conditions seen had been ophthalmia of the Koch-Weekes type, together with some diplobacillary infections; 48% were refraction cases, so that these two conditions covered 90% of the total. There had been only five cases of gonococcal ophthalmia, and at least two of these infections had been contracted before arrival of the patients in Egypt.

Some recruits who were accepted in Australia as fit for service had possessed glass eyes and a few had been totally blind in one eye. There had been seventeen patients with trachoma and practically all of the cases, so far as could be ascertained, had commenced in Australia. Lieutenant-Colonel Eason's report was in general to the same effect, though on a larger scale, as it involved many hundreds of thousands of soldiers. Thirty-three thousand cases were recorded, of which error of refraction and conjunctivitis accounted for about two-thirds. Conjunctivitis had not been so common as in 1915, due doubtless to the enforcement of stricter hygienic conditions. The types had been the same. Three hundred and forty-two cases of trachoma had been noted, and two hundred and three of these infections had been acquired before arrival of the patients in Egypt. Seventy-two had been unspecified and only sixty-eight definitely reported as recent. Of the recent cases a high proportion had been found in Australian soldiers, which circumstance raised a doubt whether they were due to primary infection in Egypt. It could be stated with confidence that, making every allowance, it was improbable that one hundred soldiers (probably a much smaller number) were infected with trachoma during the whole campaign.

The official estimates of trachoma amongst the civil population in Egypt gave 80% who were suffering or had suffered from trachoma, and 20% who were infective. As the association between soldiers and the Egyptian population had been close, and as flies were abundant, this result should cause every one to revise his ideas on the subject of the contagious nature of the disease.

Gonococcal ophthalmia in Egypt developed by two methods. It could be produced both by direct inoculation of gonorrhœal pus, and apparently also to a considerable extent by transference from one eye to another in the same or in other persons. A clinical type of gonococcal ophthalmia produced in this way had been common and most destructive amongst Turkish prisoners. At one period there had been several thousands under treatment in special ophthalmic hospitals for ophthalmia largely of this type. Only eight cases of gonorrhœal ophthalmia had been reported amongst British troops, thus making thirteen cases recorded during the campaign. Sir James Barrett, therefore, asked his audience to allow him to put the question: how was it that in a country where trachoma was almost universal and gonorrhœal cases very numerous, that only 100 cases of trachoma and less than thirteen cases of gonorrhœal ophthalmia were reported amongst British and Australian troops?

Lieutenant-Colonel Eason had had access to a copy of Baron Larrey's report on the medical arrangements of Napoleon's army in Egypt, 1799 to 1801. It had recently been found that gonococcal ophthalmia in Egypt was largely limited to the hot weather, but other varieties of ophthalmia occurred at any period of the year. Napoleon's army, 32,000 strong, had landed at Alexandria in July, 1798, and after taking that city, had marched to Cairo and thence to Palestine. There seemed to have been an outbreak of ophthalmia just after leaving Alexandria and again after their return from Palestine, when the troops were encamped outside Alexandria. In June, 1801, 3,000 men had been attacked by ophthalmia. Larrey noted that ophthalmia occurred during high Nile, which was, of course, in mid-summer. He stated that ophthalmia hardly spared anyone in 1798, but that the next severe outbreak occurred in 1801, the attack just referred to. The English who took Alexandria, had also suffered, but benefited by the advice of Baron Larrey. Larrey described the ophthalmia, the ulcers and perforations of the cornea, but noted that the tarsal cartilages were rarely affected. The epidemic was paralleled by that which occurred amongst Turkish prisoners in the summer of 1918, and was probably due to the same cause, mixed infection, clinical gonococcal predominating. The damage done was, therefore, due to epidemics of ophthalmia and not to trachoma.

In 1918, bacteriological examination, not possible in 1798, had revealed a high percentage of such cases of ophthalmia in which gonococci were found. At the present time

trachoma was rife in China and Egypt, in Hungary and other countries. It was rapidly diminishing in Australia, and was rare in England, despite the constant return of soldiers and others from trachomatous countries. What was the explanation?

In the *Intercolonial Medical Journal* of Australia, dated September 20, 1909, Dr. Orr and Sir James Barrett had published a map showing the distribution of trachoma, as far as could be ascertained, in the State of Victoria. The map showed fairly definitely that the hot, dry, dusty districts were responsible for most of the cases of trachoma.

In the third annual report of the Giza Memorial Ophthalmic Laboratory, Cairo, 1928, the ætiology of trachoma was referred to. It was believed that true trachoma could not be produced in monkeys. But follicular conjunctivitis occurred naturally in these animals; by inoculating trachomatous material into the lids of certain monkeys, a folliculosis could be produced which looked like trachoma, but it passed away, and pannus or scarring never appeared. True trachoma could and had been produced by inoculation of trachomatous material into human eyes. It was fairly obvious that the successful inoculation of human eyes with the gonococcus or trachoma involved some additional factor. It had been recently stated on experimental evidence that diluted gonococcal pus was innocuous. It might be that a mixed infection or an existent conjunctivitis was requisite in both cases, and it was noteworthy in Australia that trachoma might be rightly reached, that in an Anglo-Saxon community the danger of infection by trachoma was slight.

DR. LEONARD MITCHELL said that he had listened with very great interest to Sir James Barrett's address. His experience in Egypt had coincided with that of Sir James in that out of some thousands of light horsemen he had seen only thirty-five cases of trachoma. None of them, as far as he could ascertain, had been infected in Egypt.

DR. J. A. O'BRIEN, in conveying the thanks of the meeting, remarked that in his war experience also, almost all, if not all, the trachoma he had seen was pre-war trachoma. In view of the difficulties that had arisen since the war with regard to soldiers' pensions, he emphasized the necessity for a better ocular examination of recruits.

Encephalitis Periaxialis Diffusa.

DR. J. A. O'BRIEN showed a boy with mild papillitis in both eyes. The pupils reacted to light and accommodation; the Wassermann test gave no reaction, and there were no headaches, vomiting or convulsions. The boy had been examined by Dr. Maudsley, who found that there was involvement of the pyramidal tract on the right side and mental retardation of about one year. Dr. Maudsley considered that he was possibly an early case of *encephalitis periaxialis diffusa*.

Dr. O'Brien pointed out that in a number of cases of the disease optic neuritis had been reported, the swelling of the disc never being of a high degree. The three chief diagnostic criteria were progressive loss of vision of cerebral type, progressive spastic paralysis and progressive mental deterioration.

Optic Neuritis.

Dr. O'Brien's second patient was a young woman with optic neuritis of one eye. The only cause ascertained was marked dental sepsis. She had received dental attention and the swelling was subsiding.

Persistent Pupillary Membrane.

DR. A. S. ANDERSON showed a baby with dermoids astride the corneal margin, and a boy with persistent pupillary membrane, due to persistence of part of the anterior vascular sheath of the lens. Fine threads coming from the anterior surface of the iris just outside the pupillary margin, stretched across the pupil.

Tuberculous Iritis.

DR. MARK GARDNER demonstrated two cases of tuberculous iritis both in young women. The first presented greyish nodules in the iris of both eyes, with keratic precipitates. Under treatment with gradually increasing doses of old tuberculin, the nodules were definitely disappearing.

The second patient had pulmonary tuberculosis, and the use of tuberculin was considered inadvisable.

Sympathetic Ophthalmia.

Dr. Gardner's second patient was a young man who some twelve years previously, as the result of a blow with a piece of metal, had sustained a dislocated traumatic cataract in his left eye. The lens had afterwards been needled.

This year the patient reported with circumcorneal infection of his good (right) eye. There were fine keratic precipitates present and some exudate in the anterior chamber. Oily atropine was used every four hours and salicylate of soda pushed to a dose of twelve grammes (two hundred grains) daily. The exudate cleared up and the eye quietened down; vision of the right eye was now $^6/_6$ partly. The patient had shown no signs of overdosage with salicylate.

Retinal Disease with Massive Exudation.

DR. Z. SCHWARTZ showed a boy who had slowly developed a raised greyish patch in the retina, lying deep to the retinal vessels, at the posterior pole of the eye. In the differential diagnosis, tumour and retinal disease with massive exudate, but without gross vascular disease, had to be specially considered. The condition was thought to be a case of the latter.

Papillœdema.

DR. MAX YUILLE showed a patient with swelling of the upper half of the disc of one eye, with a corresponding loss of the inferior half of the field of that eye. The condition was thought to be syphilitic in origin.

Chorioideremia.

DR. F. MILLER presented an unusual condition of chorioideremia (congenital absence of chorioid). In both eyes there was little or no appearance of the chorioid except over a small area at the macula and at the extreme periphery. The fundi were of a glistening greenish white colour, the fields constricted to a central area, and there was night blindness.

Dr. Miller mentioned that Nettleship in 1908 had reported seven cases and had concluded that they were congenital and not the result of inflammation, because of the similarity of the condition in all recorded instances, the bilateral character and the fact that the defect of vision remained stationary and seemed to date from birth.

Familial Cataract.

DR. W. J. L. DUNCAN presented a group of familial cataracts. The mother and four children out of a family of seven exhibited an unusual form of posterior cortical congenital cataract. From the family history it seemed very probable that the mother's father and grandmother had all suffered from the same disability.

Acute Circumscribed Exudative Chorioiditis.

Dr. Duncan's second case was one which Friedenwald had described as acute circumscribed exudative chorioiditis. The patient was a young woman who had complained of sudden dimness of vision in one eye. Fine dust-like opacities were seen on Descemet's membrane, but the fundus was obscured. Later a single bluish grey patch of chorioido-retinitis was seen in the neighbourhood of the disc, and fine vitreous opacities. Focal infection in the form of dental sepsis was treated and the condition cleared up.

A MEETING OF THE QUEENSLAND BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the B.M.A. Building, Adelaide Street, Brisbane, on August 7, 1931, DR. E. S. MEYERS, the President-Elect, in the chair.

The Australasian Pharmaceutical Formulary, 1930.

MR. F. C. BENNETT gave an address on the Australasian Pharmaceutical Formulary of 1930. He first of all conveyed to members the thanks of the Pharmaceutical Society of Queensland for the courtesy of the Branch in allowing him to give the address.

He said that the formulary was issued by the Pharmaceutical Societies of Australia and New Zealand. The work of Queensland chemists had contributed much material of value to the previous and present editions, particularly the work of the late G. Mackay and of R. C. Cowley. Mr. Bennett understood that Mr. Mackay and Mr. Cowley had addressed the members of the Branch on the subject matter of a previous edition of the formulary.

In Mr. Bennett's opinion a completed formula was essentially the work of the therapeutist. Sometimes remodelling was indicated by chemical and physical science in order that the therapeutic activity intended might be obtained. Formulæ which were quite satisfactory under European conditions had not, however, always proved satisfactory under Australian conditions, and under Queensland conditions in particular. For example, the hydrolysis of acetyl salicylic acid in potassium citrate mixtures, the liberation of iodine from an acidulated iodide mixture, the formation of chloroform from an alkaline chloral hydrate mixture were cases in which the Queensland pharmacist dispensing at a temperature some 25° higher than English pharmacists, could not always slavishly adhere to text book dicta. To illustrate the value of the overhauling of a formula, Mr. Bennett referred to the comparison between the formula for Marcussen and Ehler's cream for scabies, as it appears in the 1930 Australasian Pharmaceutical Formulary, page 21, and the formula as published in medical journals early in 1930.

The formulæ of the Australasian Pharmaceutical Formulary could be regarded generally as being type formulæ of various schools of therapeutics, modified, where necessary, to suit the requirements of Australasian conditions. Many medical practitioners varied formulæ to suit their individual ideas, and in such circumstances the Australasion Pharmaceutical Formulary should constitute a valuable reference book, since it set forth the type and indicated the pharmaceutical difficulties or principles involved, and thus provided the basis for individual prescribing. It was quite immaterial to the average pharmacist whether the medical practitioner prescribed the type preparations of the Australasian Pharmaceutical Formulary or based his prescriptions thereon. To assist the medical practitioner in the latter case the quantities of the components in many of the formulæ were set out in terms of the single dose.

There were several medicaments of which the Australasian Pharmaceutical Formulary offered a range of alternative formulæ to the prescriber, and of these the more important were: (i) the paraffin preparations, (ii) the cod liver oil preparations, (iii) the diamorphine-containing formulæ.

Mr. Bennett felt somewhat apologetic in mentioning paraffin, but it might be conceded that paraffin preparations were a necessary evil. Certainly in this, and in other directions, the public needed protection against itself and against prevailing advertisements. One could not help remarking that the next generation would reap the harvest of the educational work now being conducted by the ethical medical world. Mr. Bennett ventured to predict that some secret patent and proprietary medicine vendors were pursuing a policy which must lead to extinction, and this incubus of present medical practice would be lifted from an enlightened generation to come. For the present, however, the outlook was none too bright and the psyllium seed craze had not yet descended upon them.

In the present Australasian Pharmaceutical Formulary the following preparations of paraffin for internal administration were included: confection of paraffin, emulsion of paraffin, emulsion of paraffin with phenolphthalein, confection of paraffin with malt and cascara.

The two emulsions called for little comment, except that agar was not an ingredient. From literature on proprietary agar-containing paraffin emulsions one came to the conclusion that the agar content had a special significance as a therapeutic agent apart from its use as an emulsifying agent. Its special property seemed to be the absorption of water and the provision of bulk. In agar emulsions they had a liquid phase which was more likely to lose water at body temperature than to absorb it, and it would need to lose quite a deal of water to assume, at the temperature of the body, the gel form in which it would provide bulk. The therapeutic dose of agar (British Pharmaceutical Codex) was half an ounce. To obtain this dosage it would be necessary to take two and a half pints of the usual agar-containing paraffin emulsion, and even then the agar was fully hydrated. The pharmacists of Australia considered agar so valuable as an emulsifying agent that the paraffin emulsions of the Australasian Pharmaceutical Formulary were made with gelatine and acacia.

The two paraffin confections would probably receive much attention. One contained over 60% of soft white paraffin and the other over 60% of liquid paraffin. After he had tested the confection of paraffin, the thought had occurred to him that the confection might be an advantageous basis for the administration of medicaments for the throat. The confection of liquid paraffin was a palatable preparation of high paraffin content. Phenolphthalein or other medicaments could be incorporated if desired, or the amount of elixir of cascara could be increased from the present dosage, which represented four minims in a dessertspoonful dose.

Cod liver oil preparations were: Aromatic cod liver oil, emulsion of cod liver oil (clinic emulsion), emulsion of cod liver oil with hypophosphites, malt and oil, malt and oil with iron.

These formulæ covered the usual range of cod liver oil preparations in general use. The aromatic cod liver oil represented a successful attempt to present the oil in a more palatable form, and the plain cod liver oil emulsion was of the usual type of clinic emulsion for infants.

Referring to diamorphine preparations, Mr. Bennett said that of the preparations for the treatment of respiratory throat and lung disorders contained in the Australasian Pharmaceutical Formulary he wished to call attention to the following: Elixir of diamorphine and creosote, elixir of diamorphine and terpin, compound elixir of pine, compound syrup of euphorbia.

These represented the various type formulæ in general use; there were many proprietary forms. The compound syrup of euphorbia contained locally produced tincture of euphorbia and was a preparation which would appeal to the prescriber as a local product of known composition. These preparations came within the scope of the Dangerous Drugs Section of the Poisons Regulations in Queensland and would be dispensed only on written prescription; and the prescription was required to be endorsed as to the number of times it was to be repeated.

The utility of the volume to the general practitioner had increased by the inclusion of standard formulæ for many simple combinations such as form the backbone of the various hospital formularies, for example, A.B.C. liniment; calamine lotions, aqueous and oily; ammonia and senega mixtures; gentian mixtures, acid and alkaline.

Formulæ were also given for various preparations ordered under synonyms by prescribers, such as Unna's paste; Lassar's paste; Maclean's powders, bismuth, bismuth and chalk; Mandl's paint; Dakin's solution; eusol.

The volume also set forth the usual strength of medicaments used in eye drops, mouth washes and gargles; and the appendix of the book was devoted to tabulation of official doses, poisons and their antidotes, and articles on schemes for prescribing. These items, together with the size of the volume, enabled the book to be utilized as the general pocket reference book of the general practitioner. It might be pointed out in this connexion that in the index a reference to the name of the medicament gave the most convenient reference to the preparations included. Thus on reference to menthol it was seen that formulæ were given for a compound inhalation, a compound ointment, and a parogen.

Mr. Bennett proceeded to refer to various individual medicaments and their preparations.

In regard to hypochlorites, his considered opinion, based upon experience, was that no hypochlorite preparation was satisfactory in its keeping qualities under Queensland conditions. He had found it impossible, with ordinary dispensing technique, to produce any hypochlorite solution which could be relied upon to retain 50% of its strength after seven days' keeping; and his experiments did not substantiate the results of other workers' reports, which had appeared from time to time in the journals. He would therefore suggest that the medical practitioner was on the safest ground when utilizing the Australasian Pharmaceutical Formulary preparations of eusol and Dakin's solution. If these were made at least twice a week from a fresh sample of bleaching powder, they could be expected to give as much satisfaction as might be obtained from such unstable chemical compounds as the hypochlorites.

In regard to adrenalin preparations, the anæsthetic adrenalin ointment and adrenalin inhalant were two preparations of types largely used. The anæsthetic ointment contained β eucaine and adrenalin in a lanoline and soft paraffin base. The inhalant was a one in 1,000 solution of adrenalin in a medium of alcohol and castor oil. Allied formulæ were the chlorbutol inhalant, containing 1% chlorbutol with camphor menthol and oil of cinnamon in a liquid paraffin base, and compound ephedrine spray. It should be noted that the adrenalin and ephedrine preparations came under the heading of Regulation 21 (poisons).

In referring to bromoform preparations, Mr. Bennett said that to the prescribers who required bromoform, the alternative Australasian Pharmaceutical Formulary preparations might be indicated as being good examples of the way in which the pharmaceutical chemist could make the dispensing of a dangerously immiscible drug a matter of routine. Of the two preparations the emulsion was the safer to prescribe. The linctus was more pungent and the prescribing note attached to the formulæ might be noted.

In regard to glycerophosphate preparations, the compound syrup and the compound elixir were both very elegant preparations. The syrup contained one-sixth of a grain of caffeine and one-fortieth of a grain of hydrochloride of strychnine in the usual dessertspoonful dose. The elixir contained neither strychnine nor caffeine and had a sherry, syrup and glycerine vehicle. The elixir might be utilized in many ways by the prescriber. Its freedom from potent drugs, together with its palatability, made it suitable for administration to infants, particularly as it made a palatable addition to the usual chemical food, malt and oil, or clinic emulsion forms of medication. For adult use the prescriber could compound it with strychnine, caffeine, quinine or iron, preferably in the form of a scale compound, to suit his individual requirements, and for diabetics it could be ordered *sine* syrup.

The formula for compound solution of santal had been developed by the late R. C. Cowley, who found that by the addition of olive oil to the usual mixture of copaiba and oils of santal and cubebs a saponifiable mixture of perfect miscibility resulted. The final mixture thus contained the full medicaments and was compounded with the usual buchu and *liquor potassæ* of this type of preparation.

The neutral solution of arsenic contained 1% arsenious anhydride dissolved in glycerine and diluted. It was compatible both in alkaline and acid mixtures, and Mr. Bennett recommended its use when arsenic was being prescribed for internal medication.

In conclusion, Mr. Bennett asked for the cooperation of members in utilizing the volume as one of their standard books of reference in prescribing. The preparations were such as could be made in any reasonably equipped pharmacy and the advantages of the preparations should be available to all pharmacies in Queensland. The Pharmaceutical Society and the staff of the College of Pharmacy were always willing to assist the Branch and its members in all matters concerning medical practice; any assistance or information concerning the Australasian Pharmaceutical Formulary or its preparations would be made available on application to either source.

It had been a pleasure for him to speak and he could not conclude without passing reference to the fact that the occasion was evidence of cooperation between the medical profession and pharmacists.

MEDICO-POLITICAL.

A MEETING OF THE QUEENSLAND BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the B.M.A. Building, Adelaide Street, Brisbane, on August 7, 1931, DR. F. A. HOPE MICHÔD, the President, in the chair.

Procedure in Ethical Matters.

The model rules governing procedure in ethical matters (*vide* note, page 49, Memorandum and Articles of Association of the Branch, and Rules for a Uniform Procedure in Holiday Consultations), as circulated to members on July 17, 1931, were adopted.

NOMINATIONS AND ELECTIONS.

THE undermentioned has been nominated for election as a member of the New South Wales Branch of the British Medical Association:

Dunstone, Reginald Murray, M.B., Ch.B., 1931 (Glasgow), c.o. Y.M.C.A., Pitt Street, Sydney.

Obituary.

ARTHUR EDWARD MORRIS.

WE regret to announce the death of Dr. Arthur Edward Morris, which occurred on September 17, 1931, at South Yarra, Victoria.

University Intelligence.

THE UNIVERSITY OF SYDNEY.

A MEETING of the Senate of the University of Sydney was held on September 7, 1931.

The diploma in Tropical Hygiene was awarded to John G. Drew, M.A., M.B., B.Ch., Alfred J. Geoffroy, M.B., Ch.M., and Albert Edward Platt, M.B., B.S.

The Commonwealth Director-General of Health advised that the British Government had given recognition to the School of Public Health and Tropical Medicine as a training school for medical officers of the colonial service of the value equivalent to the schools of London, Liverpool and Edinburgh.

Dr. H. S. H. Wardlaw, Lecturer and Demonstrator in Physiology, advised that he had been granted an extension of his fellowship by the Rockefeller Foundation to enable him to visit European laboratories on his way back to Australia.

An invitation was received from the University of Amsterdam asking the Senate to send a representative to attend the celebration of the tercentenary of the foundation of that university, to be held in Amsterdam in June, 1932.

The Vice-Chancellor was authorized to confer medical degrees on successful candidates on September 24 instant.

Dr. P. N. Walker-Taylor was reappointed to the Dr. Gordon Craig Fellowship in Urology for a third year, to be tenable abroad.

The following appointments were approved: Dr. A. M. Welsh and Dr. Julia Amphlett as part-time Pathologists in the Cancer Research Department; Dr. E. Murray Will as Honorary Assistant Dermatologist and Dr. R. T. Paton as Honorary Clinical Assistant, Dermatological Out-Patients' Department, Saint Vincent's Hospital.

Proceedings of the Australian Medical Boards.

VICTORIA.

THE undermentioned have been registered under the provisions of the *Medical Act*, 1928, of Victoria, as duly qualified medical practitioners:

Harris, John, M.B., B.S., 1924 (Univ. Adelaide), Box 51, Renmark, South Australia.

Mahon, Thomas Patrick, M.B., B.S., 1928 (Univ. Sydney), c.o. Dr. Fulton, Geelong, Victoria.

Books Received.

SELECTED WRITINGS OF JOHN HUGHLINGS JACKSON: Volume I, on Epilepsy and Epileptiform Convulsions; Edited by J. Taylor, M.D., F.R.C.P., with the Advice and Assistance of G. Holmes and F. M. R. Walshe; 1931. London: Hodder and Stoughton. Crown 4to., pp. 514, with frontispiece. Price: 25s. net.

DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY, by H. Bailey, F.R.C.S.; Third Edition; 1931. Bristol: John Wright and Sons. Royal 8vo., pp. 297, with 318 illustrations, some of which are in colour. Price: 21s. net.

Medical Appointments.

Dr. F. A. Hadley (B.M.A.) has been appointed a member of the Nurses' Registration Board, Western Australia, pursuant to the provisions of *The Nurses' Registration Act*, 1921.

* * *

Professor H. J. Wilkinson (B.M.A.) has been appointed Honorary Consulting Anatomist at the Adelaide Hospital, South Australia.

* * *

Dr. S. L. Cameron (B.M.A.) has been appointed Government Medical Officer at Merriwa, New South Wales.

* * *

Dr. H. K. Denham (B.M.A.) has been appointed Medical Superintendent, State Hospital and Home, Newington, New South Wales.

* * *

Dr. E. T. Morgan has been appointed Quarantine Officer, Western Australia, pursuant to the provisions of the *Quarantine Act*, 1908-1924.

Diary for the Month.

OCT. 6.—New South Wales Branch, B.M.A.: Organization and Science Committee.
OCT. 6.—New South Wales Branch, B.M.A.: Council (Quarterly).
OCT. 7.—Victorian Branch, B.M.A.: Branch.
OCT. 8.—New South Wales Branch, B.M.A.: Clinical Meeting.
OCT. 8.—Victorian Branch, B.M.A.: Council.
OCT. 13.—New South Wales Branch, B.M.A.: Ethics Committee.
OCT. 20.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
OCT. 23.—Queensland Branch, B.M.A.: Council.
OCT. 27.—New South Wales Branch, B.M.A.: Medical Politics Committee.
OCT. 28.—Victorian Branch, B.M.A.: Council.
OCT. 29.—South Australian Branch, B.M.A.: Branch.
OCT. 29.—New South Wales Branch, B.M.A.: Branch.

Medical Appointments Vacant, etc.

FOR announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xviii.

DEVON PUBLIC HOSPITAL, LATROBE, TASMANIA: House Surgeon.

LAUNCESTON PUBLIC HOSPITAL, TASMANIA: Resident Medical Officer (male).

THE BRISBANE AND SOUTH COAST HOSPITALS BOARD, QUEENSLAND: Medical Registrar, Surgical Registrar.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company, Limited. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members desiring to accept appointment in ANY COUNTRY HOSPITAL, are advised to submit a copy of their agreement to the Council before signing, in their own interests. Brisbane Associated Friendly Societies' Medical Institute. Mount Isa Mines. Toowoomba Associated Friendly Societies' Medical Institute.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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